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ARMED FORCES management

PUBLISHED FOR THE ARMY, NAVY, AIR FORCE, COAST GUARD AND MARINE CORPS

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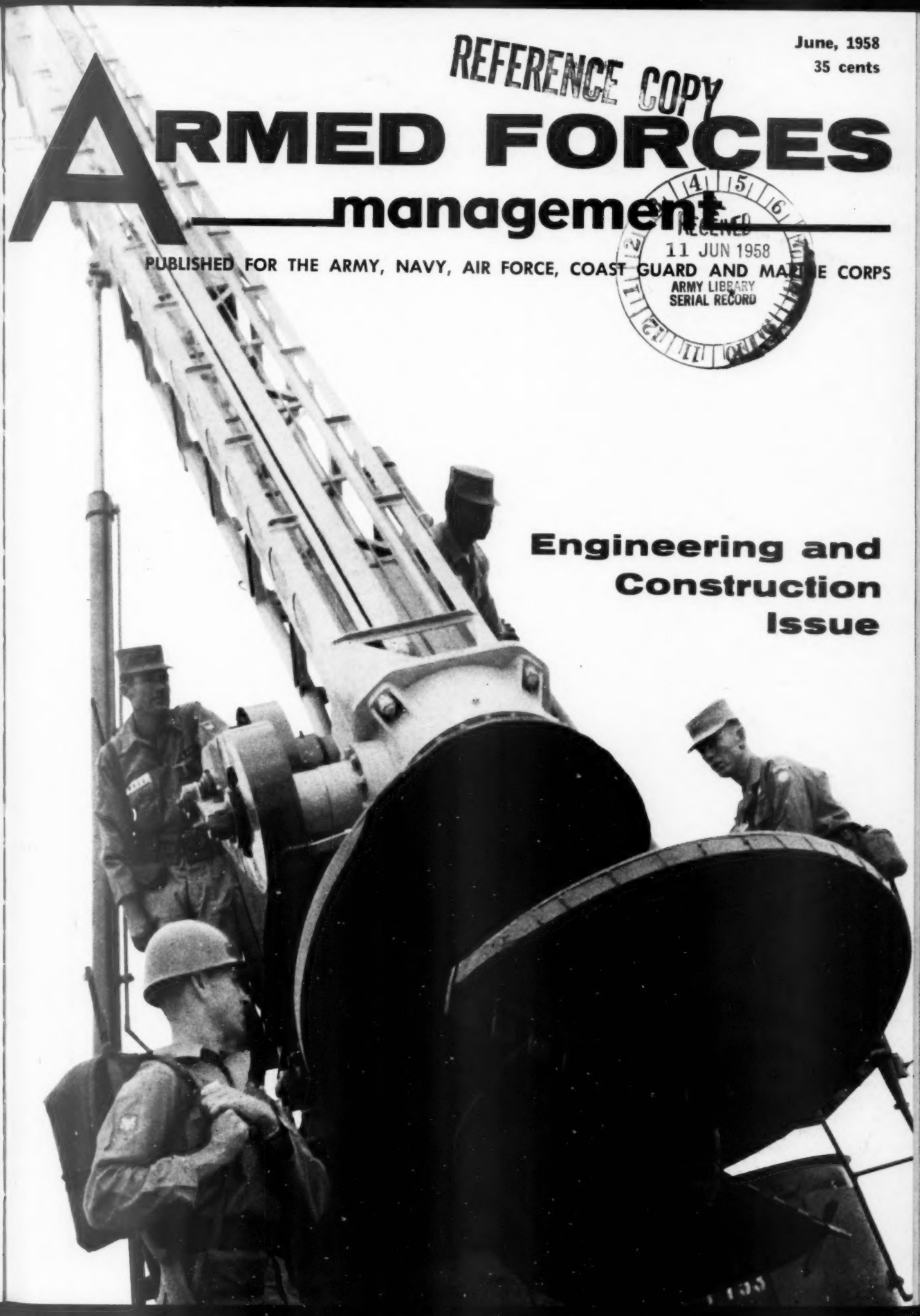

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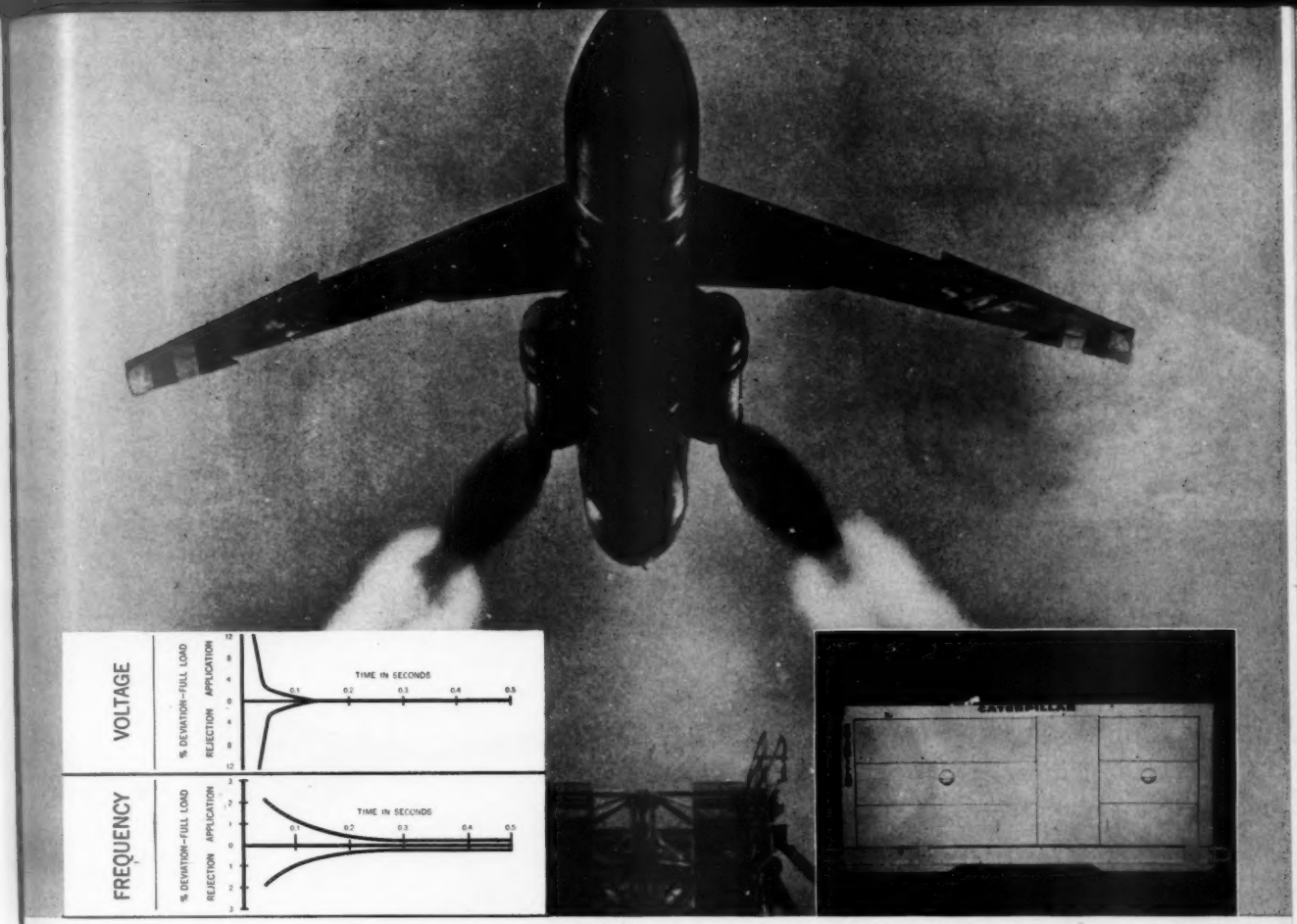

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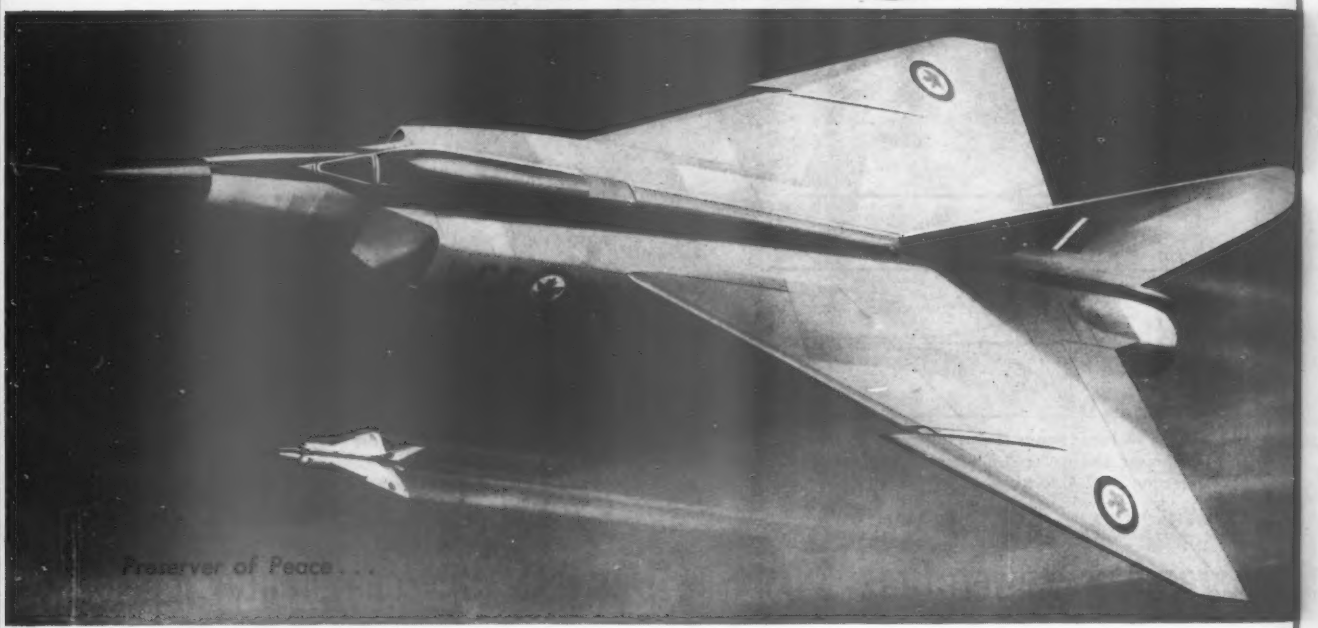

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ARMED FORCES management

PUBLISHED FOR THE ARMY, NAVY, AIR FORCE, COAST GUARD AND MARINE CORPS

JUNE, 1958

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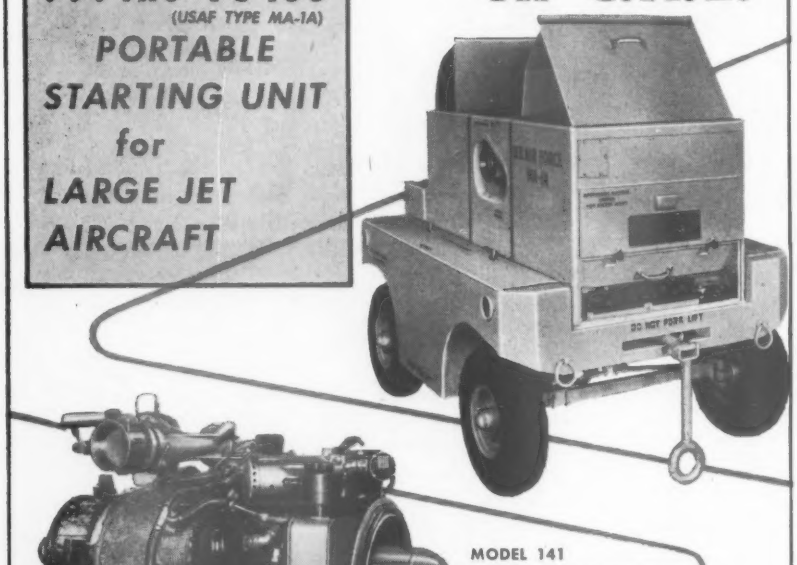

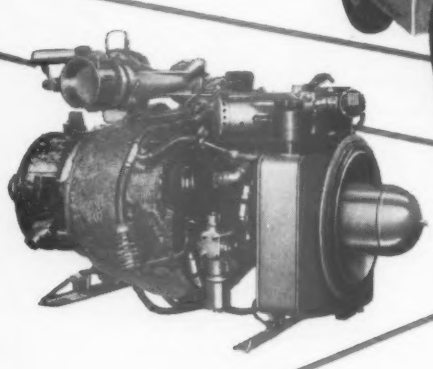

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In My Opinion

Education

A review of your May issue of ARMED FORCES MANAGEMENT, by staff members of this office, has evidenced considerable interest in several of the outstanding articles appearing therein.

As you know, this Headquarters monthly dispatches to all Air Force Major Commands world-wide a Management Improvement Reading Packet, which contains narrative articles, management periodicals, documents, brochures, and other types of reference data which is compiled for the purpose of assisting and improving management within the United States Air Force.

May we have your permission to reproduce these articles, at Air Force expense, . . . for the packet?

Orlo Austin,
Lt. Col., USAF

Hq., USAF
Washington 25, D.C.

Quality Control

Thoroughly enjoyed your article in the February issue concerning the application of statistical quality control techniques to the management rating of Air Force functions. This article is exceptionally well written and will be of great use to others.

About three years ago, the Marines developed a similar procedure for their Quartermaster functions and have successfully used it ever since. It, too, encompasses the principles of "standard deviation, the 'range concept' of performance evaluation, and other statistical methods."

Fred Thieberger
Supply Department,
Headquarters Marine Corps

Compliments

I must compliment you on your publishing the excellent article by Colonel Frank Kowalski, Jr., on "Delegate—Don't Deputize." We have reproduced this article and distributed it to each supervisor within our organization. Our entire organization operates on the very fine principle of delegating and not deputizing.

Charles C. Barbera
Capt, USAF

Base Supply Officer
Truax Field, Wisc.

Appropriation vs. Apportionment: The Misunderstood Budget

ARMED FORCES MANAGEMENT is not, by nature, a magazine for the comptroller. But it becomes more and more apparent, with each day's headlines and each new bit of testimony before Congress, that someone needs to explain to the business manager of the Armed Forces (and to the Congress which created his job, for that matter) just what the comptroller does, and why—at least at the top level, in the Pentagon.

Published testimony by military leaders before the House Armed Services Committee, investigating national defense missiles, is filled with indications that the top military echelon, in obtaining money for its programs, considers the Bureau of the Budget a pain in the neck and the Assistant Secretary of Defense, Comptroller, not much better.

The really surprising thing about all this is that the Congress seems to agree with them, even helps military brass in many cases take a swipe at the controller of the purse strings by asking leading questions. Why is this so surprising? Because it is the Congress which set up this system through which the services must wade to get money actually in hand.

Congress let go a great hue and cry about "no blank check" when President Eisenhower proposed, in his reorganization plan, a 5 or 10% flexibility in the budget request that Defense Secretary McElroy could use to support "emergency" programs. What the Congress does not seem to realize is that, if it succeeds in its nitpicking of the Bureau of the Budget and the Defense Comptroller's powers, it will, in essence, end up giving the services a blank check for their entire appropriation request.

Observers in possession of the real facts (they are all a matter of public record) in this disbursement-of-money problem are beginning to wonder just who is trying to kid whom.

Congress is indeed uninformed if it labors under the delusion that the money it appropriates for a given fiscal year actually is spent that way to the last nickel. Nor, if the tax dollar is to be used wisely, should it be. Says Defense Comptroller McNeil, "The crux of the matter is the difficult task of reaching the proper decisions in these days of rapid change, technological progress and frequently conflicting military and technical advice. Once firm program decisions are made, the record will show that apportionments are made speedily."

A Navy witness before the House committee recently, voiced the chief criticism of this "appropriation, then-apportionment" process. He said, "We have been faced, ever since I have been in this job, with an interim process which has been superimposed on us, after the Congress has authorized and appropriated money—namely, the business of allocating that money. We can't go ahead and plan out a program with full knowledge that we are going to get the money that the Congress has authorized when we think we should have it." Other top military men, in other words, have said the same thing.

Do they know that Congress set up this process back in 1870, has continually amended and sharpened it since then, reenacted it in its present form less than eight years ago as Section 1211 of Public Law 759? The Bureau of the Budget and the Defense Comptroller are required by law to do what they do in overseeing the expenditure of military funds. Do they realize that it is in connection with the apportionment request that some parts of the final "shopping list" for the year are presented for approval for the first time? Do they know that appropriation requests often bear little resemblance to the money actually needed at the time of apportionment not only because of technological change or planning change in the meantime but also because, to the discredit of the military, there is a great deal of fakery in some of these budget requests submitted to military headquarters?

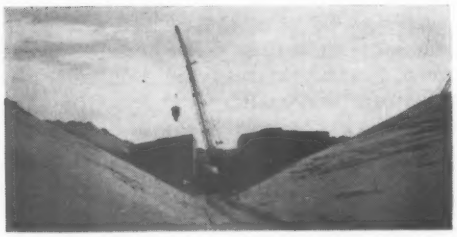
Criticism of the process itself is, in many cases, justified, as even the comptrollers who work in the system will state, because it does take a while to get things done. But better this system than none at all. Some Congressmen have indicated a desire to do away with the apportionment process and make appropriations mandatory and not just "authorized." To do so would be the best way imaginable, at the moment, for Congress to abrogate its time-honored jealous control of Government finances and would open a floodgate of misspent money that could bankrupt the Nation in a year.

More to the point, right now, Congress (which created this process in law) and the Services (which function under it) should stop trying to perpetuate the myth that military budget troubles are the fault of the Comptroller and the Bureau of the Budget. If the process is more harmful than good, then change the law. By criticizing the Comptroller and not the law, critics are managing (1) to broadcast a great deal of misinformation and (2) publicly confess their own ignorance.

Bill Borklund

Construction Problems

Army Engineers . . .



Latest Army photos show state of construction at Cooke Air Force Base, Calif. Top left: interior of missile assembly building; above: Thor launcher under construction; below: closeup view of the same launcher; on facing page: initial work started on Atlas launcher and service building.

Their Plans for Building New Air Force Missile Sites

by Maj. Gen. W. K. Wilson, Jr.

Deputy Chief of Engineers for Construction
U.S. Army Corps of Engineers

IF ONE or more Soviet intercontinental ballistic missiles were to flash across the Polar skies aimed at destroying our military bases or our great industrial centers, how quickly could we reply in kind?

The answer rests with the Air Force and the United States Army Corps of Engineers, which are engaged in one of the greatest military construction programs in the Nation's history—the building of Air Force bases from which our own intercontinental ballistic missiles (ICBM) can be launched and our missilemen trained to launch them. Working in cooperation, these two branches of our defense are engaged in a military construction program that will cost in excess of two billion dollars.

The number of such bases to be constructed ultimately is a military secret. Two operational bases are under way at Cooke Air Force Base in California and at Frances E. Warren Military Reservation in Wyoming. Test launching facilities are already in operation at Cape Canaveral, Patrick Air Force Base, Fla., and there are specialists' training installations to be built at Chanute AFB, Illinois; Keesler AFB in Mississippi; and Sheppard AFB in Texas.

Originally planned as a training center for personnel who will fire the ICBMs and the smaller intermediate range ballistic missile (IRBM), the mission at Cooke has been expanded to include both training and operations. But before the first ICBM ever noses its way through the ionosphere out over the blue Pacific Ocean, on whose shores Cooke is located, millions of man-hours will have gone into the planning, design and construction of the technical and support facilities at the base. The same can be said for Francis E. Warren and all of the other bases to follow.

The technical facilities design for both Cooke AFB and Francis E. Warren is being accomplished by an architect-engineer firm, Holmes and Narver of Los Angeles, for the Air Force Ballistic Missile Division, with the Corps of Engineers' District Engineer at Los Angeles serving as reviewer and liaison officer for the Corps. In addition, the District Engineer is supervising all of the construction work as well as designing the support facilities for Cooke. The Omaha, Nebraska, District Engineer has been assigned the job of designing the Francis E. Warren support facilities and he, too, will supervise all construction work.

At each of these installations, the Corps of Engineers must build launching stands and service buildings, assembly buildings, blockhouses, guidance facilities and structures for an electronic device called wave guides. Then there are the nose-cone facilities, liquid-oxygen generating buildings, water pumps for cooling the missile, missile support towers and dozens of other structures, including training buildings, barracks, utilities, runways, roads, water stations and Capehart housing. For every one of these structures there must be a design, preparation of plans and specifications, cost estimates, working drawings and bidding documents drawn up. Of course at Cooke, a former Army installation, most of the support work will be in the nature of rehabilitation of existing structures. Nearly 200 buildings are involved.

The first launching complex at Cooke for the Atlas missile is under construction. While this construction is going on, the Engineers will also build a training launcher for the Thor (IRBM), the Air Force's 1,500-mile-range missile. The pattern of construction will be virtually the same at Warren, except there will be no Thor activities there or in any of the other operational bases to follow.

Present plans call for the construction of the launching complexes by squadron, with each increment being installed in rotation until both Cooke AFB and Francis E. Warren AFB are equipped with launchers and other necessary installations. Naturally, the Corps' workloads are heavier than usual, especially in the office of the Los Angeles District Engineer. He has set up a special branch and employed additional skilled professional and technical personnel to monitor the design work being done for the Air Force Ballistic Missile Division.

At Francis E. Warren, the Engineers' activities have not proceeded much beyond the acquisition of an additional 8900 acres of land and the soils explorations, which consist of drilling test holes to varying depths to determine how deeply pilings will have to be driven for the launching pads in order to attain the proper resistance to the missile thrust. The Corps is also doing some detail mapping to determine the contours of each of the areas where the technical or launching equipment will be erected. The Engineers have had to build some access roads also.

The engineering problems that present themselves are knotty and numerous. However, the experience gained at Cape Canaveral, where the Corps has installed since 1951 more than $100-million worth of missile technical and support construction, is standing the Engineers in good stead.

Testing operations at Patrick AFB required construction of many various and novel types of structures, such as blockhouses, launching stands, missile

assembly buildings, engineering laboratories, telemetry stations, research laboratory, administration and office

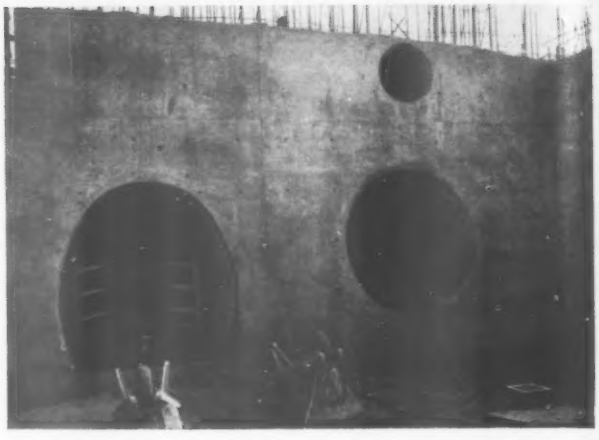
building, liquid-fuel storage dispensing systems and many others. The completion dates established for most of these structures, in order to meet the operational requirements of the using service, provided only the absolute minimum construction time. The compressed design and construction schedules together with the difficulty in procuring certain long-lead-time items constituted a considerable problem to the Corps of Engineers. In most cases, however, the using service was given beneficial occupancy in accordance with the approved schedule.

The Air Force work at Cape Canaveral includes complexes for the Atlas, Titan and Thor missiles which line the Florida shoreline in an area about halfway up the coast from Miami. But before these and other installations could be erected—they were working on nothing but a sandy beach—many areas had to be built up with two to three feet of fill, which was dredged from the Banana River bottom.

The Engineers learned at Canaveral that they had to put piles down to provide the required stability for the firing pads for the Atlas and Titan missiles. They knew what the load or thrust would be and they had to go deep enough to get the necessary resistance.

Then, the nearest railroad was 20 miles from Canaveral. As a result, all building materials and equipment had to be moved in by road. This included hauling over an eight-mile causeway with room for only two lanes of traffic crossing the Banana River or over a second two-lane road from Titusville, also about 20 miles distant.

All of the aggregate to be used in the concrete for the firing pads, blockhouses and other structures had to be hauled in by truck. And it was necessary to build two concrete batching plants at the site of construction.



Not a drainage system but cable tunnels for the Atlas launcher at Cooke AFB.

Procurement of materials was a major problem. Nonconventional materials and equipment were virtually designed as the technical installations were built. Very little was purchased "off the shelf" of suppliers. This called for many change orders and the closest kind of cooperation between the Corps of Engineers, Air Force, architect-engineer and the contractors.

In order to meet the Air Force testing or firing schedule, it is sometimes necessary for the building contractors' men to be working on the same structure where the missile contractor is installing his equipment. Often, construction men may be working all around the electronics technicians.

The problem of obtaining skilled construction workers in itself has been a serious one, with contractors importing men from all parts of the United States. Housing of workers is an important factor in recruiting them. There simply isn't any housing near Canaveral or Cooke. In view of the remoteness of these bases, workers find it necessary to drive from 15 to 60 miles to and from work each day.

The immensity of the areas in which these projects are being built presents a communications problem for the resident engineer. (Cooke AFB contains a total of 67,000 acres.) At Cape Canaveral, the resident engineer is equipped with two-way radiotelephone in his office as well as in his automobile and it is in constant use as he moves about from one part of the reservation to another. His inspectors' automobiles are similarly equipped, enabling the resident engineer to communicate with each or all of them as the need arises. Often, at one of the construction sites, he may find it necessary to dictate a memorandum that requires immediate action. He can pick up the radiotelephone and a stenographer in his office takes the dictation. Thus, he doesn't have to rely on penciled notes or memory. It all goes into the record without delay.

In any engineering project of the scope of Cape Canaveral, Cooke AFB or Francis E. Warren, there are bound to be many difficult construction and personnel problems. At Cooke alone, for example, there are four firms of architect-engineers, 17 prime contractors and thousands of workmen involved. These problems, it has been found, can be minimized through frequent conferences of the resident engineer, the Air Force representatives, the architect-engineers, the building contractors, missile contractor and representatives of the labor unions. Many potential misunderstandings are averted.

Supervision of construction of these huge missile complexes and their support facilities is the responsibility of the District Engineers of the U.S. Army Corps of Engineers. With the cooperation of the Air Force and the technical know-how of the American construction industry, they will complete the job on schedule. In 183 years and numerous wars and disasters, the Army Engineers have never failed to make their construction capability a power for victory and accomplishment.

Just beginning to take shape is an Atlas launch operations building, i.e., blockhouse.

Why Navy Construction Plans Are Changing Character

by RAdm. E. J. Peltier, CEC
Chief of Civil Engineers

THE MAY 1958 issue of ARMED FORCES MANAGEMENT contained an article entitled "Cape Canaveral . . . Doorstep to Space." The article was of special interest to military men because it called attention to the fact that although Canaveral was built as an Air Force installation, it is, in operation, an all-service facility. As such, it is an outstanding example of interservice cooperation. And it is typical of many facilities now being built by one defense agency for another or with common use in mind.

In discussing the construction problems of the Bureau of Yards and Docks it is important to emphasize this fact, since much of this bureau's work now falls into this category. The tremendous program for the construction of Air Force and Navy bases in Spain, which is now approaching completion, is an example of this. The installation of the offshore radar platforms known as "Texas Towers," which we are accomplishing for the Air Force, is another. A third example is the construction of the Pacific Missile Range at Point Mugu, California, which the Navy will build for the use of all Services.

Such projects help to demonstrate the scale of this Bureau's activities, which include the design, construction and technical maintenance of the Naval Shore Establishment. They also indicate the changing character of our work during the post-World War II period.

It should be explained that the Shore Establishment consists of buildings, structures and utilities with a replacement cost of some $17¾ billion, installed on nearly five million acres of Navy-controlled land. However, these figures are rapidly changing because of the number of new structures required for the nuclear-missile age and the vast acreage involved in the new installations.

The advent of the jet airplane, the missile and the nuclear weapon has called for a program of construction that has taken us far afield from the type of construction in which the Navy was involved prior to World War II.

These construction projects are not headline items for the general press. For the most part they are backstage operations that precede the appearance of the headline item. But they are vital to its successful development.

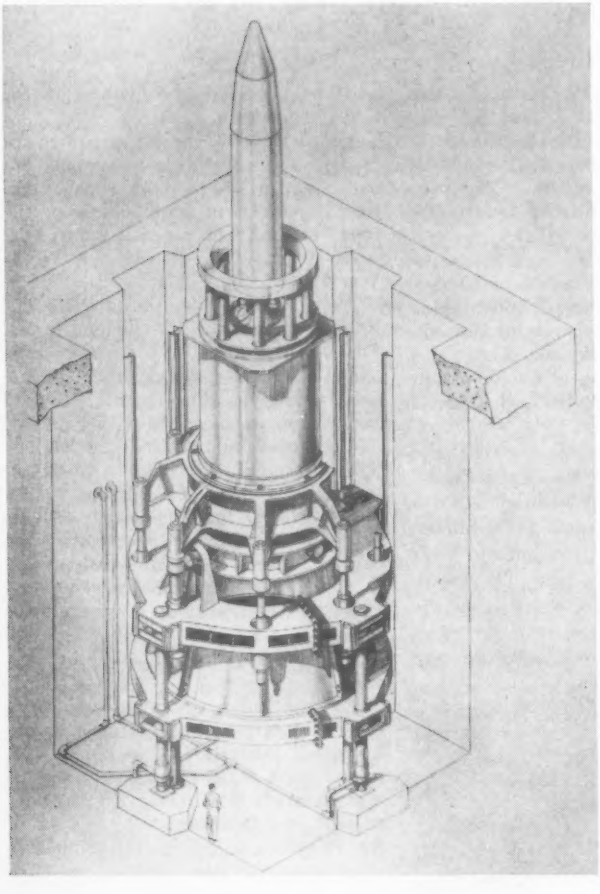
The Polaris missile is a widely publicized example of such a development. The Bureau of Yards and Docks is engaged in four separate construction projects directly concerned with various aspects of Polaris development. Each calls for certain specific construction considerations. And each demands expeditious handling to accomplish the project as soon as possible.

Two of these are civil-works projects in progress in California. At the Lockheed Aircraft Co. in Sunnyvale, a new plant is being built at a cost of approximately $10 million to augment present prototype and test facilities of the Polaris missile which Lockheed is conducting for the Bureau of Ordnance. The District Public Works Officer of the 12th Naval District has awarded a contract for engineering services and plans and specifications for this facility. Meanwhile, the Bureau of Ordnance is providing the equipment to be installed in this structure as soon as it is ready.

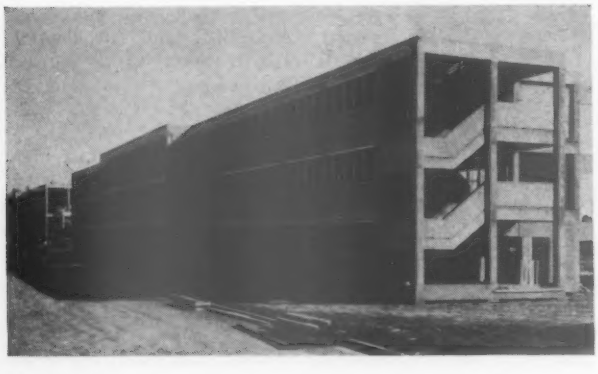
At Sacramento, a similar agreement has been reached with the Aero-Jet General Corp. to provide facilities and equipment for propellant development and test work. In this project, the military construction funds amount to approximately $6,700,000, while the Bureau of Ordnance has provided approximately $7,500,000. Because of

Navy construction workers pour base for five 10,000-gal. ready-storage tanks at Moron, Spain. When erected, each will supply 600 gals. of fuel a minute.

Nearing completion is this jet stand at Quonset Point, Rhode Island, Naval Air Station.



Artist's sketch of the Polaris sea-simulating launcher nearly completed at Cape Canaveral, Fla.



Just beyond the "roughed in" stage are the newest type of enlisted barracks, under construction at the Naval Air Station, Kingsville, Tex.

the need for expeditious action on these projects, the bid times have had to be set as short as possible with early completion dates for facilities construction.

At San Clemente Island, Project "Pop-up" involved construction of a foundation for underwater launching trials of the Polaris. Here also, speed was of the utmost importance. Therefore, the request for approval of this project was submitted separately in the request to the Bureau of the Budget for apportionment of funds, and the work was authorized as a change order to an existing contract at San Clemente Island. The construction contractor finished the work one day ahead of the prescribed completion date. As a result, the first shot was successfully fired on March 23, 1958, approximately seven months after the Bureau of Ordnance set the actual planning of the program in motion.

At Cape Canaveral we are engaged in providing facilities for the installation of a large ship simulator which will provide performance evaluation of the Polaris.

This device should be mentioned in some detail because it is expected, in the long run, to be an extremely important aid to the development of the missile.

The major function of the simulator will be to determine the limiting condition under which the missile can be safely launched from a moving platform. In the process such factors as crew safety, operation of the launching mechanism and operation of the activated guidance controls and motor under dynamic conditions will be studied.

It is designed to duplicate the essential features of the motion of the ship. Therefore, it will be capable of producing a periodic roll and pitch motion in any direction, while at the same time producing the heave motion. And it will be capable of maintaining the motion despite large changes in weight and force such as must occur during launching.

What makes the device even more valuable is the fact that actual ship motions can be reproduced from magnetic tape recordings taken at sea. In this way, operational studies can be made of many devices under controlled and repeatable conditions.

Two other programs in which we are engaged will affect not only the Polaris but all missiles under development. In the Atlantic, the Bureau is building the downrange portion of the Air Force Missile Test Center, Patrick Air Force Base. This program, amounting to some $37 millions, involves construction of quarters, subsistance, power, water treatment, sanitary and

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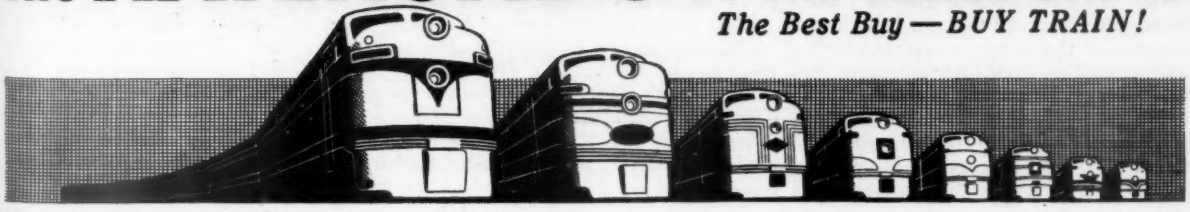


radar buildings, roads, and operation, optical instrumentation, weather, and communications buildings for complete facilities to support guidance, tracking and testing of various missiles. In this program the Air Force is the sponsor and management agency as it is at Canaveral.

In the Pacific area the Bureau is planning construction of the base previously mentioned at Pt. Mugu. This range, which will be built and managed by the Navy for all-Service use, will extend approximately 500 miles along the coast and about 250 miles seaward.

The range will be operated as a complementary facility to the Cape Canaveral range. It is planned that the Pacific range will support training operations, while Canaveral will continue to specialize in research, test and development support.

One other facility that is closely related to recent military developments is the projected Very Low Frequency Radio Station the Bureau is to build at Cutler, Maine. Recent newspaper headlines concerning the "fail-safe" method of halting nuclear strikes have emphasized the absolute necessity for reliable communications to naval forces throughout the world, whether under the sea or in the air. The Cutler radio facility is designed to operate at powers up to two million watts.

The contractual arrangements for this facility are somewhat unusual. Normally the "brick and mortar" are handled separately and apart from the design and manufacture of the equipment to be housed therein. However, in this instance, the construction involved does more than provide a foundation and shelter for the equipment and machinery. It is a vital part of the installation and contributes mechanically and electrically to the output.

Therefore, since the electronics contractor for the design and manufacture of the equipment is required to guarantee the desired results, that firm has been given responsibility for all aspects of the work, including construction of all elements of the radiation systems.

A brief glance back into the history of the Navy would show that construction projects such as these were unthought of at the beginning of World War II.

It is not inconceivable that 15 years from now there will be equally radical changes in the weapons system which will necessitate great changes again in the Naval Shore Establishment. It is vitally necessary, therefore, that our planning be sufficiently long range and thorough in its concept to be ready for those changes as they come.

Shift in Key Personnel

DEFENSE DEPARTMENT

Maj. Gen. Otto L. Nelson, Jr., USA (ret'd); to serve as special assistant to Secretary McElroy in connection with Defense Department reorganization.

ARMY

Richard Morse, president of the National Research Corp.; to serve as chairman of the Army Scientific Advisory Panel.

Brig. Gen. Samuel E. Gee, assistant commanding general, 7th Infantry Div.; to Camp Irwin, Calif. in August.

Brig. Gen. Harold G. Hayes, Signal Officer, Hq. 8th Army, Japan; to Office, Army Chief Signal Officer, in July.

Brig. Gen. Stuart S. Hoff, Office, Army Chief Signal Officer; to 8th Army, Seoul, Korea, in August.

Maj. Gen. James Dreyfus, Office, Army Chief Signal Officer; to Office, Joint Chiefs of Staff, in August.

Maj. Gen. Samuel L. Myers, deputy chief for training, Military Assistance Advisory Group, Vietnam; to Office, Deputy Chief of Staff, Logistics, in November.

Brig. Gen. Cyrus A. Dolph III, deputy director subsidiary activities, the Joint Staff, JCS; to deputy chief for training, MAAG, Vietnam, in October.

Brig. Gen. Herbert L. Scofield, commanding general, Utah General Depot, Ogden; to Office, Chief Signal Officer on July 15.

Brig. Gen. Ralph T. Nelson, commanding general, U.S. Army Electronic Proving Ground, Ft. Huachuca, Ariz.; to Office, Chief Signal Officer, in August.

Brig. Gen. Frank W. Moorman, U.S. Army Attache, Paris, France; to U.S. Army Electronic Proving Ground, Ft. Huachuca, Ariz., in August.

Maj. Gen. John B. Murphy, Hq., U.S. Continental Army Command, Ft. Monroe, Va.; to Office, Chief of Staff, as of June 1.

Brig. Gen. Clement F. St. John, commander, Landstuhl Army Medical Center, Germany; to Brooke Army Hospital, Ft. Sam Houston, Tex., in July.

Maj. Gen. Stuart G. Smith CG, Brooke Army Hospital, Texas; to Letterman Army Hospital, Presidio of San Francisco.

Brig. Gen. George T. Powers III, DivArty Co. 7th Division, Korea; to Hq. U.S. Army, Ryukyu Islands in Sept.

Maj. Gen. Hugh Mackintosh, Asst. Quartermaster General for Administration; to Executive Director, Army Military Subsistence Supply Agency on August 1.

NAVY

Rear Adm. William D. Irvin from deputy director for communications and electronics, Joint Staff, Joint Chiefs of Staff; to commander, Operational Development Force, Atlantic Fleet, in September.

RAdm. Edward C. Stephan from chief of legislative liaison, Navy Department; to Commander, South Atlantic Force, about August.

RAdm. Michael F. D. Flaherty from Commander, Cruiser Div. Two; to Commander, Middle East Force, in September.

RAdm. Joseph E. Dodson, from Force Material Officer, Staff, Commander, Naval Air Force, Pacific Fleet; to Assistant Chief of the Bureau of Aeronautics for Procurement, in July.

RAdm. Clarence E. Ekstrom from Commander, Fleet Air, Eastern Atlantic and Mediterranean; to Bureau of Naval Personnel, about July.

RAdm. Robert W. Cavenagh, Commander, Amphibious Group Two; to Naval Attache, London, England in August.

RAdm. Horacio Riverio, Jr., Commander, Destroyer Flotilla One; to Director, Long Range Objectives Group, Office of the Chief of Naval Operations.

RAdm. Roy L. Johnson, Longe Range Objectives Group, OCNO; to Comdr., Carrier Div. Four.

AIR FORCE

Chaplain (nominated for Maj. Gen.) Terence P. Finnegan to serve as Air Force Chief of Chaplains in August.

Maj. Gen. Millard Lewis, Assistant Chief of Staff Intelligence; to senior Air Force member, Military Studies and Liaison Div., Weapon System Evaluation Group, Office, Asst. Sec. of Def. (research and engineering).

Lt. Gen. O. S. Pilcher, Deputy Director for Strategic Plans, the Joint Staff; to Director, the Joint Staff.

Maj. Gen. Joe W. Kelley, Director of Legislative Liaison Office, Secretary of the Air Force; to commander, Air Proving Ground Center, Eglin Air Force Base, Fla.

Washington Background

PAYBILL JUST PASSED MAY HURT, rather than help, a good many career military officers. Cause is "unrealistic" attitude of Congress, says critics, towards FOGYs, *i.e.* in-grade pay raises which used to come every two years *ad infinitum*. Congress placed limits on FOGYs, saying they were a "reward for mediocrity." This is not quite true. Army officers are particularly upset since promotions, through no fault of theirs, are at virtual standstill. Net result: with no promotions and no FOGYs either, pay raise actually amounts in many cases to a pay freeze at present income.

CORDINER REPORT PROPONENTS are apprehensive, now that the pay plan has passed, that other, equally important aspects of the report may die unheeded. General feeling in Congress is that Cordiner proposal has been taken care of, interest is waning. Just as vital, but unpublicized, were Cordiner recommendations to improve Service housing, pay hardship compensation for out-of-country tours in such places as Thule, Antarctica.

CLAIM BY MILITARY procurement officers that about 20% of the missile dollar is going to smaller firms has not satisfied investigating Senate Small Business Procurement Subcommittee. Problem, as military is discovering, is that too much of this investigation (which seems never to cease) is larded with Congressional efforts to make political hay. Said one Pentagon spokesman, "They don't really seem interested, often, in the facts of the story. All they want is a place to yell 'More!' so the voter will hear them."

CONSTANTLY INCREASING TENURE OF SERVICE required for promotions, particularly in the Army, is causing growing rumbling of dissatisfaction among military officer corps. Unless the trend is halted, service problems in holding top officer personnel are going to become hectic, in spite of cheers over the new pay law.

ARMY TRANSPORTATION CORPS has a brigadier general learning how to fly preparatory, say crystal-ball jockeys, to setting up an assistant TC chief for aviation. Reason, they say, is to nail down TC's asserted right to handle research and development of new or proposed Army aircraft; prevent, if possible, somebody coming up with the idea of organizing a separate Army Corps for Aviation to handle these things.

BUDGET TROUBLE IS NAGGING the Navy and Air Force. Both the Air Force and the Navy's Bureau of Aeronautics are still having trouble living within expenditure ceilings set by the Bureau of the Budget, despite the drastic cutbacks order last summer during the so-called economy wave. Result: unless expenditure ceilings both for fiscal 1958 and 1959 are raised, reprogramming actions almost as drastic as those which took place last summer can be expected.

MAY ISSUE OF *Fortune* magazine published an article by Burton Klein which Military research and development people are calling "recommended reading." First article published by a "general public" type of magazine in a long time which proceeds from facts to facts, knocking holes in all the windbag verbage about what is wrong with our Military R&D. Basic contention: "We need *more* competition, duplication, and 'confusion' in our military research and development programs."

A BIG B-47 MODERNIZATION PROGRAM may be in the making, as the shift to B-58 moves slowly. Air Force is looking at age and condition of planes involved in recent accidents. Odds are the IRAN (inspect and repair as necessary) program at Douglas, Tulsa, will be expanded sharply, with the possibility that another manufacturer will be brought in.

SIGNIFICANCE OF THE *NAUTILUS* POLAR CRUISE has been lost in all the missile talk. Navy people are afraid its terrific propaganda possibilities have been ignored. Termed one of the most incredible adventures in naval history, the *Nautilus* cruise lasted 5½ days, during which the ship cruised more than 1000 miles beneath the arctic ice pack. Russia's long northern coastline has, before, been protected by the ice pack. It is now vulnerable—the ice pack now protects the submarine—and, the Navy adds, from the ice pack east of Spitzbergen, it is only 1420 miles to Moscow as the missile flies.

THE ARMY TAIL DID A MASTERFUL JOB of wagging the Army dog in late May. Army Secretary Brucker and Chief of Staff Maxwell Taylor gave ground under fire and decided, for public consumption, to retain the Army's present 37 National Guard and Reserve Divisions, rather than eliminating 10 as they had hoped. State governors and the National Guard Association had bitterly assailed the plan announced last March 31. In retreating, Taylor let go a parting shot: "The 'logic' of Joint Chiefs of Staff war plans would call for going ahead with the 10-division cut." Under the new decision, it will be necessary to spread available manpower and equipment more thinly, he added. Said one disgusted Army planner, "Maybe we should keep the National Guard and get rid of the Army."

OVERLOOKED IN ALL THE RECENT hullabaloo over the Strategic Army Corps (STRAC), the Army ground counterpart of the Strategic Air Command, is the uncertainty in some circles over how the group will be transported quickly. There are no known plans to give STRAC any other than the usual transportation service. The result is obvious: STRAC is designed to retaliate in a hurry, will be all ready to go same place, but will have no way to get there.

MILITARY IS LOOKING HOPEFULLY at Defense Secretary Neil Hosler McElroy's move to abolish several Defense Department committees and his appointment of Otto Nelson, New York Life Insurance Co. vice president, as special assistant to study ways of cutting away Pentagon committee underbrush. Service types have long contended that this vast committee armada, with their delaying effect on decision-making, has been the chief reason for the Pentagon snarl—reorganization plans to the contrary notwithstanding.

AS PREDICTED IN THIS COLUMN three months ago, Defense Secretary McElroy is being forced into an either/or decision on the Jupiter/Thor which-to-produce problem. Thor, and manufacturer Douglas Aircraft, as of the moment, hold most of the aces:

1—Douglas right now has production capability to turn out reported 20 Thors a month, more than enough to handle present IRBM plans;

2—Jupiter production is some nine months behind Thor and likely to fall even farther back;

3—These are first-generation missiles and, in view of the small number needed, there is great deal of doubt, say observers, over necessity to establish new production capability at Chrysler plant in Warren, Mich.—which has yet to make a Jupiter (they're still being "hand-built" at the Army's Redstone Arsenal).

Interesting sidelight to the whole question: reason the Air Force-developed missile has the edge is a top management idea, now being used in all AF big-missile development, to build production capability during research and development phase. In other words, experimental parts are turned out on production line equipment as much as possible, require little more than additional work force to step up turnout after "bugs" are out of missile and it is declared operationally ready. Convair's Atlas is using the same system as will, presumably, the AF Titan ICBM.

YOU MAY HAVE NOTICED a sudden drought in information about Strategic Air Command activities. Reason: SAC is having skull-pounding headache trouble in its European public-relations program. SAC Information Service officers were recently pulled into Washington from Europe, told to clamp the lid on SAC publicity until our Allied populations cool off a little.

★

ARDC to Cut Decision Leadtime

Air Research and Development Command is trying to put its house in order so that it can meet the requirements for hardware which the United States will face 20-25 years in advance.

Steps being taken by ARDC were outlined before the Air War College at Maxwell AFB. **Objective** of the program is **to reduce the long leadtime of 1-10 years** for decision-making and to assure the availability of facilities when needed.

First step in the program is the work of the Summer Study Group established by the National Academy of Sciences at Woods Hole, Mass., under the direction of **Dr. Theodor von Karman,** in which some of the country's leading scientists participated. The evaluation of the technical problems faced by ARDC in making long-range plans will again be studied at Woods Hole this summer.

Second major step is the study made of management problems by a committee headed by **Dr. H. Guyford Stever,** formerly AF chief scientist. The committee's report will be delivered this month to AF Chief of Staff General Thomas White. How much of the report will be made public will be determined by the Office of Secretary of Defense, according to informed sources.

Third step relates to facilities planning. Here the objective is to determine critical areas of concern, provide priority, assign specific tasks for ARDC and recommend action for other agencies, industry and universities to meet the 10-year to 20-year technical forecast. In this effort, **Rand Corporation, Stanford Research Institute** and the **Arthur D. Little Co.** have been considered as having "the technical competence, resources and management ability to do the job."

Navy Opens New Plant For High-energy Fuels

The Free World's first full-scale production plant for high-energy fuels—boron-based chemical fuels that will impart greater range and speed to airplanes and missiles—was opened in mid-May by the Navy at **Model City, New York,** north of Niagara Falls.

The high-energy fuels plant was built by **Olin Mathieson Chemical Corp.** for the Navy, which originated research in boron fuels. The plant will produce liquid HEF-2 (High Energy Fuels-2), a mixture of boron, hydrogen and other chemicals. The $4.5-million plant is adjacent to a larger Air Force high-energy fuel plant scheduled for completion sometime next year; will make fuel shipments available to both the Navy and Air Force.

Chaff Test Facilities Behind Schedule

Chaff test facilities in the **Air Force** are **lagging behind schedule** despite a 10-year-old recognition of their importance, according to Air Research and Development Vice Commander **Brig. Gen. J. W. Carpenter III.** The chaff is used as an electronic countermeasure and in plotting wind flows in high-altitude jet streams.

Carpenter cited specifically the Verona, N.Y. electronic countermeasures test center, which is not fully instrumented, and the not-yet-completed Melbourne, Fla., chaff test cite, which lacks funds for completion. Melbourne has been in the works for over three years and the Verona facility, located near Rome Air Materiel Depot, has been under development since 1953.

Northrop Plans Manned Space Lab

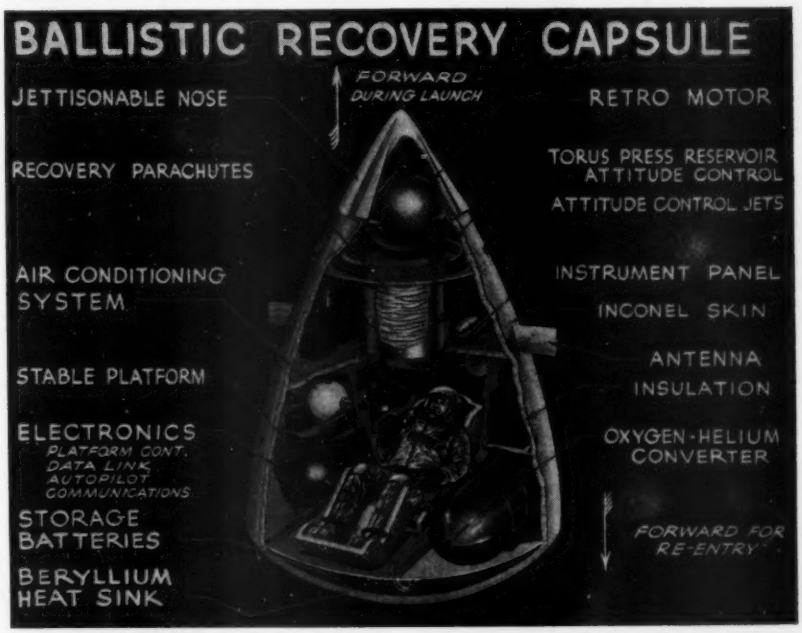
A program for putting a recoverable manned space laboratory into orbit within three years was **outlined** recently by a top engineering official of **Northrop Aircraft, Inc.**

George F. Douglas, engineering vice president for the company's Northrop Division, said the division has "developed basic design criteria for a perfectly feasible manned space laboratory" to be used in preparation for U.S. military ventures into space.

The space laboratory would be a bullet-shaped capsule, approximately seven feet in diameter and 10 feet long, Douglas said. The space traveler inside it would be strapped in a near-reclining position in order to withstand the forces of acceleration and deceleration.

Contemporary rocket engines would boost the space laboratory into orbit.

Once in orbit, it would be turned by attitude control jets so that its blunt end faces forward. This would provide a high drag to slow the capsule as it hurtled back into the earth's atmosphere. Otherwise, Douglas explained, the man would be crushed by the force of gravity and burned up by friction.



At a point halfway around the earth from the landing spot, reverse thrust rockets would slow the capsule so that it would drop into an elliptical orbit whose lowest point touched earth.

Action of the rocket would be controlled by a star-tracking navigation system similar to the one Northrop developed for the Snark intercontinental guided missile, which the company produces for the U.S. Air Force.

During re-entry the vehicle would slow from 25,000 feet per second to

Engineer Douglas

1000 feet per second—the speed of sound—by the time it descended to 60,000 feet altitude, Douglas said.

Between 20,000 and 30,000 feet altitude, parachutes would open to ease the capsule to the ground.

Douglas emphasized that the manned satellite program is proposed as a necessary step before specific military vehicles can be developed for use in outer space.

"It is essential, in the interests of national solvency and technical expediency, that we carry out a broad program of space research before we consider developing space hardware for specific military application," he declared. "How do we know if these military projects are feasible until we get some detailed answers in such critical fields as human engineering, vehicle design and propulsion systems?"

Heavy cloud of smoke trails from mouth of prototype launcher for the Navy's Polaris fleet ballistic missile, undergoing testing at San Francisco Naval Shipyard, Hunter's Point, Calif. At upper right, huge dummy missile made of concrete and steel can be seen falling toward the bay after successful launch. The dummy is then retrieved from the bay for study and reuse. Tests are being conducted as a joint enterprise of Westinghouse Electric Corp., developer of the launcher, and Lockheed Missile Systems Division, Polaris missile system manager.

Shifting R&D Support Is Costly

The on-again-off-again public support of military programs since World War II has hampered research and development and has **cost the U.S. millions** of dollars in waste, **Richard E. Horner,** Assistant AF Secretary (R&D), told the House Subcommittee on Appropriations.

"I personally think that the people of the United States are going to have to be educated to the necessity and desirability of supporting a constant level of research in the military sciences," he said in testimony recently released. "It is almost impossible to imagine the havoc which is created in a research and development program by trying to rapidly reverse the level of support of the program."

Horner said the nation is wasting millions through cancelling programs, starting programs, accelerating programs and slowing down programs. He called this the major problem over the past few years in reaching military R&D objectives.

Major AF systems canceled last year were spelled out: the Republic F-103 Mach 3.7 fighter using a combined turbojet and ramjet and constructed of titanium; the Douglas C-132 logistic support transport; the North American Navaho missile, and the Lockheed Q-5 supersonic ramjet target drone.

Horner said USAF "could usefully spend more money than we are now showing to you in the present program (R&D)," but conceded that since 1950 support for Air Force R&D has been the most consistent in history. "We feel that we have really accomplished a great deal during this period because of this support."

He testified that Air Force now has about 1000 research and technical development projects.

Asked if he felt a higher level of R&D expenditures was necessary at this time, he commented that as long as the international situation demands ever-increasing military capability, "I think that same situation requires an increasing research and development program simply because we have more weapon systems to work on, more different ways of carrying our military problem forward."

Space Agency Plan Faces Opposition

Defense Secretary Neil Hosler McElroy, his Advanced Research Projects Director **Roy Johnson,** and top Army and Navy spokesmen have joined Congressional forces in **opposing President Eisenhower's proposed civilian-controlled space agency. Air Force** alone has **supported the measure** in the Defense Department.

McElroy told Pentagon newsmen he felt DOD should continue to handle "funding and direction" regarding space programs, said that national security demanded Pentagon control of military space operations. Navy Asst. Secretary (for Air) Garrison Norton and Army Secretary Wilber Brucker testified in a similar vein against the bill before Sen. Lyndon Johnson's (D-Tex.) Senate space committee.

Missile Development Change Seen

A. G. Waggoner, executive assistant to the Pentagon's Guided Missile director, as a result of high research and development costs and fast obsolescence rates, **outlined some missile development "musts" recently.**

Waggoner has called for a broad research program and for missile design with flexibility, both at service and operating levels, permitting more military tasks to be performed by each system. Also stressed by Waggoner was the need to accept only those missile developments offering "major improvement" over existing systems, and the need to use fully the technical and production capabilities built up since World War II.

The assistant to Defense Missile Chief William Holaday said, "Cost and complexity have increased to the point where the development price of a completely new guided missile system may well exceed its ultimate cost." Waggoner said cost and the current three- to five-year obsolescence rate demand "that we take some steps to correct this."

Nuclear-Powered Rockets Push Foreseen

Big push is expected behind **nuclear propulsion for rockets** on the theory that nuclear power represents the best means of getting man into space for any length of time. Scientists expect **tests due this summer** on **Projects Rover** and **Pluto** will demonstrate the soundness of this approach.

Argument for drive to nuclear power is that it represents a dramatic

means of leapfrogging ahead of the Soviet scientists in an area where the U.S. has already demonstrated its technical and scientific know-how, and would stop much of the anticlimactic effort now under way to stay even.

About $20 million is included in the current budget for construction of test facilities for nuclear rocket and ramjet engines. Additional money is provided but not spelled out for security reasons in the FY 1959 budget. In addition, about $10 million in construction funds from nuclear rocket projects were withheld in FY 1957 by the Bureau of the Budget and are now being released. And Navy funds for feasibility studies in the ANP area have also been recently released.

Air Force Recovers Over 20 Nose Cones

The Air Force has brought more than **20 ballistic missile nose cones** back from outer space successfully through the extreme heat generated by reentry into the earth's atmosphere.

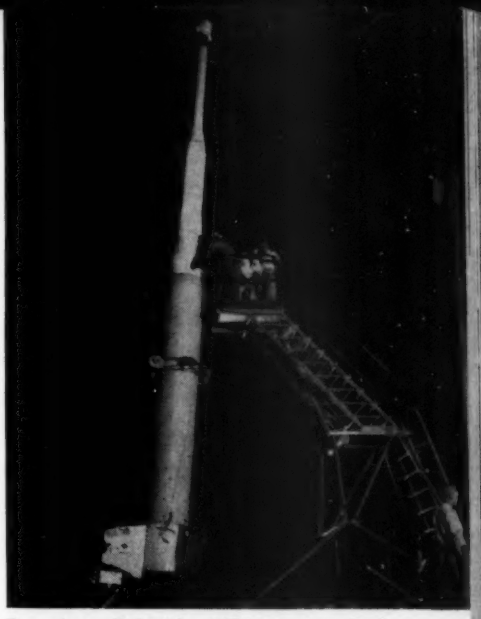
Commenting on the achievement, **Maj. Gen. Bernard A. Schriever,** Commander of the Air Force Ballistic Missile Div., said **the reentry problem was simulated** using the three-stage **Lockheed X-17** ballistic missile, which carried the experimental nose cones into space and brought them back.

"We first accomplished this very important scientific breakthrough more than a year ago," the general said, "when the first of a series of X-17s were fired in Florida. The nose cones impacted off the coast."

The general indicated the shape of the nose cone was one of the most important factors in this investigation of the heat-barrier problem. The test flights substantiated the theoretical calculations which led to the design of a suitable nose cone configuration.

Two important techniques were involved in the X-17 program. These were the use of a free-flight approach with the X-17 to simulate conditions the operational missiles would encounter, and the use of telemetering data (radio signals) from the X-17 during its journey into space, its hypersonic plunge through the atmosphere, and down to impact.

In the test procedure, the X-17, a three-stage, 40-foot-tall rocket, is blasted high into the ionosphere, from the Air Force's long range missile test center at Cape Canaveral, Florida. Reaching the top of its arc-like flight, the missile hurtles downward into the atmosphere where the first stage is discarded and the second stage fired. This accelerates the missile to a tremendous speed through the earth's heavy blanket of air. After the second stage is exhausted and discarded, the third stage is ignited, driving the missile at even greater speed. During the brief flight of the missile the telemetering system aboard transmits data on speeds, temperature, pressures and other quantities, almost to the instant of impact.



Forty-foot-tall Lockheed X-17 receives final checkout before ballistic-missile nose-cone test flight.

Remote-control Landing Under Marine Test

Remote-controlled amphibious landing is undergoing test by **the Marine Corps** on the West Coast.

On Pacific beaches at Camp Pendleton, and Monterey, Calif., Marines have been surf-testing amphibious vehicles controlled by radio from helicopters hovering overhead. In this technique, the "driver" guides **Marine LVTs (Landing Vehicle, Tracked)** with a portable electronic control panel.

By moving a steering stick, similar to an aircraft control stick, and by manipulating buttons and switches mounted on the panel, the driver can start and stop the engine, steer, shift gears, brake and apply the throttle. In short, he can operate the vehicle almost as well as if he were seated at the manual controls—and he can see better.

Radio-control system was developed for the Marine Corps by **Lear, Inc.**

Wave of unmanned Marine Corps amphibious assault vehicles churns toward shore under electronic control of helicopter-borne driver.

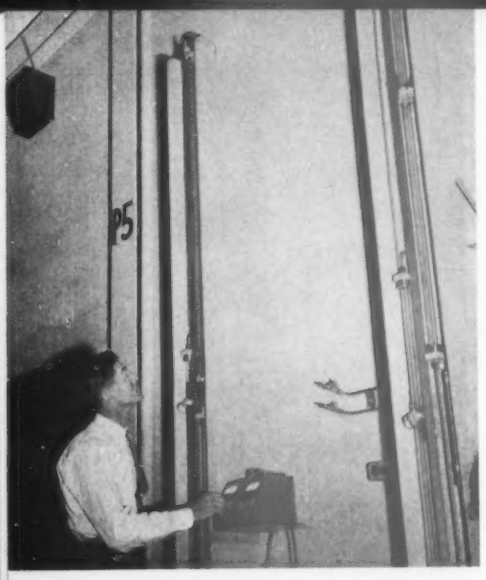
Honeywell to Develop Honest John "Kit"

Minneapolis - Honeywell Regulator Co. is developing a **new nuclear warhead** for the **Army's Honest John** tactical-support missile. When operational, it will permit frontline troops, who can fire the Honest John at a moment's notice from its own self-propelled launcher, to use either the nuclear warhead or a conventional explosive, as the tactical situation demands. Amount of the contract and general specifications of the warhead are classified.

White Sands Used As Pt. Mugu Model

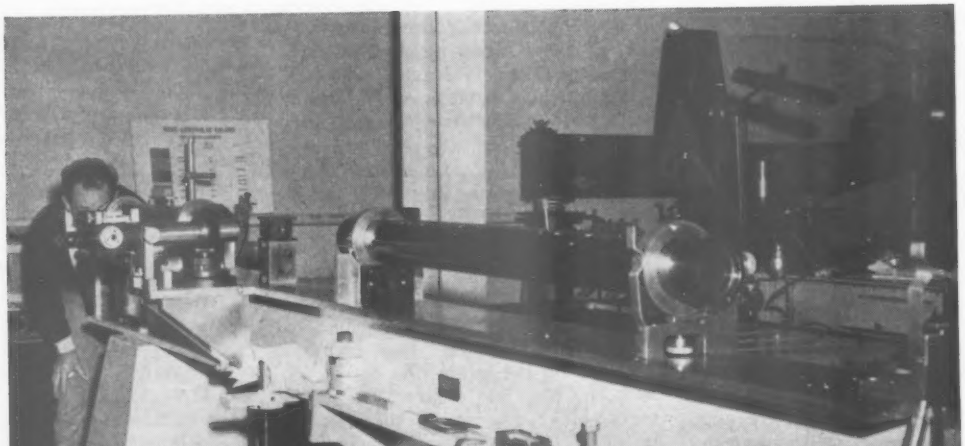
White Sands Proving Ground was used as the **model for** the new tri-service **Pacific Missile Range,** opened last month at Pt. Mugu, Calif.

Details of Army-Navy-Air Force operation at WSPG were presented to PMR by **Col. B. R. Luczak,** chief of Integrated Range Mission at WSPG, and **proposed methods of operating** the new range were offered the Range Steering Committee by **Dr. Wernher von Braun.**



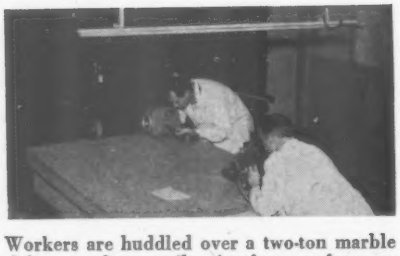
Electro-Mechanical Standards employee reads 100-inch barometer, one of three in the Air Force.

A Zeiss universal measuring machine is the instrument. Dimensional Standards worker is checking the angle of thread gages.



Worker is checking a telescope by sighting on an optical square, a palm-sized gadget costing $500.

Glamour boy of calibration, the optical proving ring, is shown calibrating a 120,000-lb. proving ring. Mechanical press holds rings while machine at right applies pressure.



Workers are huddled over a two-ton marble slab, an almost vibration-free surface on which other surface measurements are taken.

Dayton Depot . . .

Where the Air Force Measures the Measure

by Ruby Brothers

FOR 48 hours last fall President Eisenhower's plane, the *Columbine II,* was grounded at Bolling Field outside Washington, D.C. All of its glide slope receivers were faulty. To any average person—even to a man on skiis—a glide slope receiver is technical mumbo-jumbo. But to any aircraft's instrument landing system (ILS) it means everything. Without proper glide slopes, landing in the fog or rain with limited visibility could be disastrous.

The 1298th Air Training Group at Headquarters MATS, which is responsible for the *Columbine,* put in an urgent phone call to AMC's Dayton AF Depot in Ohio. In no time at all, depot workers got together with local representatives of the Collins Radio Company, which makes the receivers. They spotted the source of trouble and, within 12 hours, had modification kits winging toward Bolling Field and the *Columbine.*

Take this one vital electronic supply action, multiply it by 2,492,000, and you will begin to have an idea of what goes on every minute of the day at Dayton AF Depot under the Quick Reaction Program started last year. For this is the number of orders that Dayton filled and delivered to all parts of the world in 1957.

Direct USAF Source

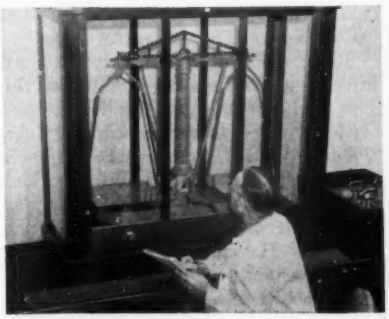
For the thousands of vital parts in today's electronic-equipped Air Force, there is only one source of supply. Whether you are an electronics technician in Alaska, Japan, Morocco, or in any of the Military Assistance Program countries, you order directly from Dayton whenever you have an electronic or an equipment-testing need. The request may be for a tiny resistor, an electron tube, a magnaflux or a test bench weighing two tons—but you get it directly from Dayton if it has to do with electronics or calibration.

Dayton AFD is prime for all USAF airborne radio and navigational radar equipment, electronics countermeasures, test equipment and all common parts for airborne and ground electronics systems. (All fire-control systems, for instance, have 80% common parts.) Dayton AFD is also home of the USAF Bureau of Standards—the mathematical and measurement fountainhead for all electronic and mechanical standards in the entire Air Force.

In 1798 Eli Whitney introduced a production concept destined to revolutionize manufacturing.

He suggested the manufacture of firearms using his Theory of Interchangeability. This meant that similar parts of different guns would be made as much alike "as a copper plate engraving."

Nowadays, the idea of identical size



Calibrating dead weights is one of Standards' most important jobs. This Master Even Balance calibrates dead weights from 1/16 oz. to 50 lbs. to a one grain accuracy.

for the same parts is taken as a matter of course. But in the 18th century, Interchangeability was as far from the average man's conception as weekend trips to Mars is from ours, perhaps even further.

Until Whitney's time, guns and the matinal parts of the dawning machine age had been made by the handicraft method, each part turned out solely for the gun or machine it was intended to support. "Experts," reactionaries refusing to depart from the ancient handicraft method of manufacture, derided the Cotton Gin inventor and prophesied certain doom for his efforts.

But Whitney, enlisting the aid of Thomas Jefferson, proved his theory dramatically before Jefferson, President John Adams and other officials by assembling 10 muskets from parts handed him at random by the officials.

Forcefully this machine age patriarch demonstrated the practicality of interchangeable-parts manufacture. A new era in industry was born.

One hundred and sixty years later, Standards, the bed-fellow to whom Interchangeability was wed in its youth, has come increasingly to the fore.

Now, with man's conquest of the air and imminent conquest of space, parts "as exactly alike as a copper engraving"—even to three millionths of an inch—are needed more than ever.

To insure such exact manufacture constant calibration is needed. To have a basis from which to calibrate, Standards are necessary.

Standards are needed, according to Robert Albaugh, chief of USAF's Bureau of Standards, so that machines making the countless parts in today's aircraft and missiles can be set to precision tool parts to millionths of an inch of exactness.

Calibration service overseas is now done by contract. General Electric does it for Spain, Italy and North Africa, while Radio Corporation of America does it for northern Europe (England, France, Germany). The AF provides the facilities and equipment, the contractors provide the trained technicians. Studies are being made for similar contract arrangements in the Pacific.

Bureau of Standards

In the precision needed for modern aircraft and missile parts, a thousandth of an inch is beginning to look like a gap as wide as the Grand Canyon. Tomorrow's parts will be measured by millionths of an inch. The tremendous pressures created by increased speed, altitude and weight of modern aircraft mean that parts must be re-

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placed often and be far more exact than in the past. A 40c bolt a thousandth of an inch too small could cause the destruction of an $8-million aircraft and crew. An ICBM fired over a distance of 5000 miles could miss its target by as much as 100 miles if its precision parts are off an infinitesimal bit.

All of this and more is the direct concern of the USAF Bureau of Standards at Dayton AFD. This bureau is to USAF and its manufacturers what the National Bureau of Standards is to the nation. It breaks down into three branches.

Dimensional standards is the oldest of the three. Absolute need for interchangeability of parts in aircraft made its establishment necessary. This branch calibrates the equipment used to check machinery for size. In other words, it checks precision gage blocks and other precision measuring equipment to be sure that they themselves are at proper standard.*

Electromechanical standards has to do with test equipment in the fields of vibration, optics, weight and force measurement and temperature over 600° and up to 4000° Fahrenheit.

Electrical Standards Branch has recently been shifted from its berth at DAFD to Boulder, Colorado. The NBS calibrates electrical equipment for the Armed Forces and industry manufacturing for the Department of Defense. DAFD's Branch at Boulder, in turn, calibrates the transfer standards used by AMAs and Depots in the field.

Standards reach like an ever-alert, three-legged watchdog over the world. The body belongs to the NBS while DAFD's three branches are the legs.

Today, when we measure an inch, we're certain that it is exactly one inch long. But when Whitney set about tooling his plant at Whitneyville, outside New Haven, Conn., there was no standard inch in the United States. There was a closely approximated version of our present unit of measurement, but for Whitney's purposes there could be no variation.

To fill this void, Whitney established his own standards. They worked well for Whitney but there was still a need for accurate standards and it grew more imperative as the machine age burgeoned.

In 1827, a Frenchman named Jacques Babinet suggested that wavelengths of monochromatic light could be used as natural and invariable units of length.

Babinet's pronouncement further dispelled the mists shrouding the omniscient Standards at whose door Whitney had knocked.

In 1892-3, an American physicist, A. A. Michelson, assisted by J. R. Benoit, made the first determination of the meter in terms of cadmium red radiation. Chemical properties of the ductile metallic element were already known, so that when applied to meter measurement, an unvariable meter could be established.

Ten-inch gage block being measured on this interferometer was .000006 less than 10 inches, which is .000004 short of being acceptable to the AF.

Michelson's discovery meant the beginning of the science of Interferometry and provided the gateway to calibration's pinnacle—absolute measurement.

Interferometry is a means of measuring lengths and contour of gage blocks, which are blocks of steel, in various thicknesses, used to set machinery making precision parts.

Gage blocks are the main business for DAFD's Dimensional Standards Laboratory. Their importance can never be magnified. A machinist constantly refers to his gage blocks to make certain that his machine is adjusted to the exact width he needs. A hair's breadth variation is enough to assure AF rejection of the part.

Dimensional Standards Chief Harry Glanzer points out that the approximate width of a human hair is .003, three thousandths of an inch. In other words, it would take about 3000 hairs, laid side-by-side, to constitute an inch. In the Dimensional Lab, Glanzer and his men are interested not in the thousandths but in the millionths of an inch.

Using instruments such as the Interferometer, Glanzer's people can measure the difference between wave lengths in the color spectrum as shown

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* *The word calibrate comes from the word caliber, which probably comes from the Latin qua libra, meaning what pound, what weight, what size? In other words, to calibrate means to measure the measure that measures the measure. If, for instance, Sam's tape measure is not up to standard, he will in all probability make the pants too long.*

by each of four different light sources: Cadmium, Krypton, Helium and Mercury 198.

An Interferometer uses the accurately known wave lengths of these light sources which, when passed through an optical system, cause interference fringes that are then interpreted much the same as lines on a contour map.

For instance, half wave lengths in yellow vary and can be measured to a fantastically accurate .000011566215 of an inch. Glanzer says that work is going on now to cut the variance down to .0000005, about one-twentieth of a wave length. NBS men are attempting to measure to one-tenth of one millionth of an inch and think they just about have it.

Measurements as accurate as this must be made in special surroundings. When the AF Bureau of Standards was established at DAFD in April, 1954, the Dimensional Standards Lab remained at Wright-Patterson. Equipment at the lab was too delicate to move and there was no other location as ideally suited for Dimensional Standards calibration as the W-P lab.

Glazer's home-away-from-home for the last 17 years is set on steel beams sunk into an immense concrete foundation resting on bed rock, some 12-18 feet below the surface. Bed rock, in this case, is a shale deposit. Wood blocks are used for flooring.

Because of the effect temperature has on metal, the Branch works in a suite

Asbestos gloves keep warmth of Dimensional Standards worker's hands from affecting 20-inch gage block he's calibrating on a Two-Millionths Comparitor.

of rooms in which a constant temperature of 68 degrees, plus or minus only one degree, is maintained as well as a relative humidity of 45 per cent.

Air pumped into the room passes through an oil filter to free it from dust.

All this care is necessary to keep the room free from vibration and foreign particles that can effect the hypersensitive instruments used in calibration. Since the laboratory goes down to bed rock, only the vibration of the earth can be recorded.

Temperature and humidity are controlled because the machinery is so incredibly delicate that the heat of a man's body a foot away from an instrument is enough to throw the needle into a dancing frenzy on its dial.

Air Force depots and installations throughout the world have been visited by the DAFD men at some time. They instruct calibration men at these bases on the use of complicated new machinery and, at times, carry calibrated equipment to the using activities.

Classes on the use of laboratory instruments are also instructed at DAFD. For example, last March manufacturers conducted classes for about 40 airmen on the use of the A-1 Barometer, one of Electro-Mechanical Standard's instruments.

Personnel from all bases also visit DAFD. Usually they bring gage blocks that need calibrating or the dead weights that need checking and which must be hand-carried back to the base.

Measurements to millionths of an inch such as are taken at DAFD are many times more accurate than needed for manufacturing purposes. But when DAFD calibrates a gage block to two millionths of an inch, it reduces the margin of error in machine operation to, perhaps, only thousandths of an inch, still within tolerance standards set by the NBS and AF.

Absolute measurement is the goal of the AF Bureau of Standards. This is the most accurate means of calibrating a gage block. Calibration is calculated optically in the seventh decimal (ten millionths of an inch) by using three or more different wave lengths of light and a mathematical computation instead of a master (NBS-calibrated) block.

According to Glanzer and Albaugh it's not a fantasy or pipedream but a soon-to-be-realized fact.

Albaugh cites the German war effort during World War II, as compared with our own, as an example of the need for exact calibration and its resultant interchangeability of parts. German parts were machined to a certain degree but had to be hand fitted to each plane. Ours fitted each plane and could be interchanged rapidly.

Goering's Luftwaffe was repeatedly handicapped by inoperable aircraft during the war while our ground crews performed the needed miracles enabling the Allies to attain air supremacy.

Calibration, which is measurement and standardization, is the mother of production and DAFD is the babysitter—the only one of its kind in the Air Force.

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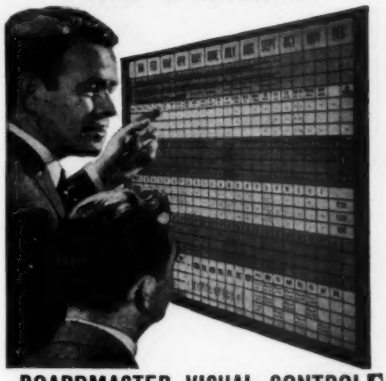

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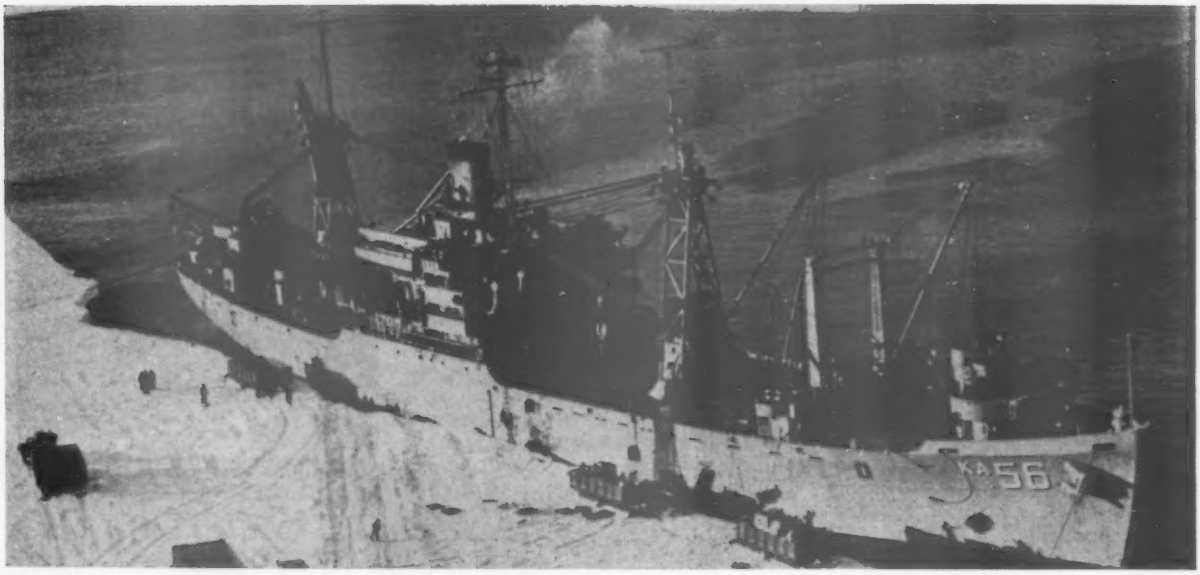


The 37-ton low ground pressure tractors spotted empty sleds alongside cargo ships for offloading supplies, then moved away from the edge while the sleds were loaded, retrieving them by cable, to lessen the danger of breaking through the ice during base construction at Antarctica for Operation Deep Freeze.

The Backup to Military Construction

by J. P. Hensley

Manager, Special Governmental Projects Engine Division, Caterpillar Tractor Co.

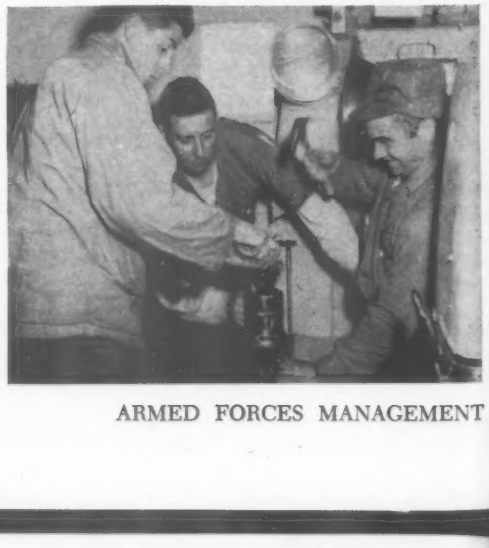
WE, AS A NATION, are fortunate that the military has immediately available to it for new construction a vast number of domestic contracting companies with their technical capabilities and reserve of construction machinery. This construction industry has built up and prospered under our free-enterprise system, which encourages effiicent operation. Rapid advances has been made in the use of materials—brought about in the freedom of individual initiative.

We, in the United States, all too often overlook one of our greatest assets—our ability to build. This ability was practically forced upon us by the vast territory our forefathers found and shaped into the United States we know today. The thousands of streams to be crossed, countless miles of roads to build, rivers to control and mountains to level provided the challenge tht made Americans the builders of today.

This need for building has brought about the development of whole industries to provide the design and the tools to bring that design into being faster, easier and at less cost. These industries are also key workers in our race to keep our defensive and offensive strength to a level that will discourage any aggressor until a true world peace can be realized.

We have the broad base of design talent, engineering know-how and construction and production ability of no other country. We have the ability to assist other countries in developing their resources and remaining inde-

(Left) With doors open for quick escape if necessary, a Navy Seabee approaches a giant crevasse which has been blasted open and filled with 105,000 cubic yards of snow.



(Right) Ingenuity took over when parts ran out. Here, a hammer, pliers, and blow torch turn pot holder into engine push rod.

pendent within the free-world community. While other countries surpass us, momentarily, in certain limited fields, we are the unquestioned world leaders in the construction of roads, dams and similar major works. There is little question our foreign aid has generated more respect in connection with the public-works construction we have done around the world than any other phase in this program. The use of private contractors for military construction has had the dual effect of strengthening our construction industry and releasing the military from performing tasks for which they have neither the manpower nor equipment to efficiently complete.

We, here in the United States, should take pride in our ability to build and illustrate to other countries how our ability has been developed. The requirements of the military on the construction industry has had an important role in the development of equipment and procedures. World War I brought about the first large-scale requirements for crawler-type tractors. These tractors proved their worth during the war and later found their way into wider applications in construction.

World War II provided the military with the opportunity to fully utilize the reserve of talent and equipment provided by our civilian construction industry. The Navy's organization of the Seabee's construction battalions was practically a direct transplant of civilian construction personnel and technical know-how into Navy uniform. Korea again brought out the capabilities of man and machinery to operate under unfavorable conditions.

We are now living under threat of another war. In order to prepare ourselves for defense it has been necessary to construct vast networks of warning stations and operational bases throughout the world. Without our ability to utilize the capabilities of our industry, these installations would never have been built in time nor have been economically feasible.

To illustrate the backup provided by industry, I cite an example. Thule Air Force Base in Greenland put through an emergency request for a 300-kw generator set. Three days later a 25,000-lb. Caterpillar diesel electric set was unloaded from an Air Force C-124 cargo plane. The next day electric power was being supplied to meet the requirement. This was only possible because standard products were available from industry to meet the military need.

Another example: the almost insurmountable tasks faced by construction battalions building seven small Antarctic outposts on ice and snow-covered wasteland for Operation Deep Freeze, one segment of U.S. participation in the International Geophysical Year.

At one station alone, Byrd Station in Marie Byrd land, high on the Rockefeller Plateau, more than 500 tons of cargo had to be moved the 660 miles to the station on 20-ton sleds pulled by Caterpillar low ground pressure D8 tractors, 72,000-lb. machines with extra-long, extra-wide tracks, exerting less than 4 lbs. per square inch of ground pressure.

Navy Seabees, hauling in the cargo to build the station, walked behind their tractors as an extra precaution in crossing crevassed areas, guiding their behemoths by reins attached to steering and master clutch levers. If the tractor should break through, the men would have a chance to get clear.

Just staying in operation was a hardship. Due to the extreme cold, tractor engines could be shut down only for brief servicing. A cold engine would take up to eight hours heating with a Herman-Nelson heater under a tarpaulin to warm it enough for starting.

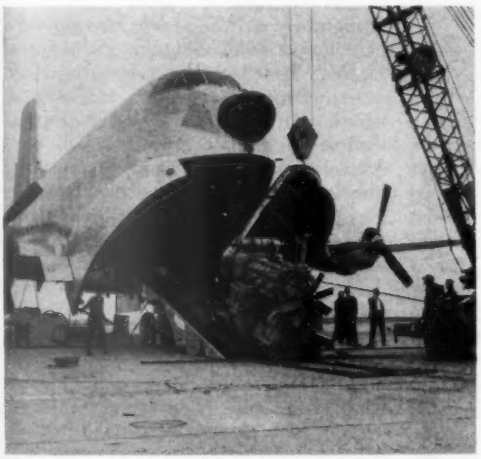
The Seabees needed 24 men to build a station on the South Pole itself for 18 scientists. They worked in temperatures ranging from 25° to 35° below zero in a rarefied atmosphere at 10,000 feet, where men and machines could operate at only 60 percent efficiency.

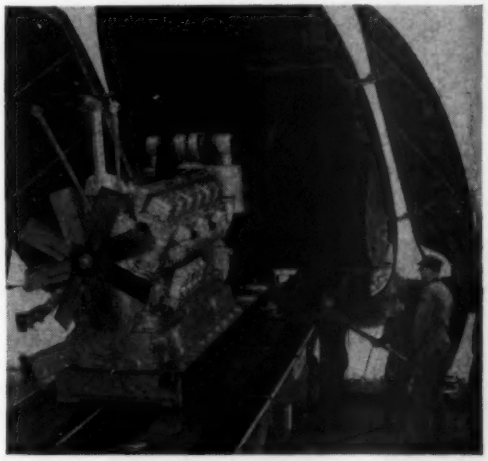
To clear a 300-feet-wide by 6,200-feet-long runway for Navy and Air Force cargo planes, Seabees had only one bulldozer, a standard Caterpillar D8, available to clear from 8 to 14 feet of snow. (The other one, in hauling supplies from shipside to the airstrip camp, had dropped through a crack in the ice and plunged 600 feet to the ocean floor, carrying its 22-year-old driver with it.) The tractor rang up 8000 hours of nearly continuous operation in the little over two months needed to complete the job. During that time, the temperature ran to 60° below zero and men had to be replaced every 45 minutes.

And so the camps were built. Ice and snow, wind and cold, all combined to repel the "can do" men of Operation Deep Freeze. But they beat the elements and the schedule with ability, experience and off-the-shelf equipment with a built-in versatility.

The ability of men and machinery to operate under all conditions has been amply illustrated by the recent operations of the Navy in the Antarctic and the Army in Greenland. These tremendous undertakings depended upon construction-type crawler tractors modified for snow travel for the transport of materials. The same type of diesel engines used as prime power for the tractors also provided the power for driving generators for lighting, communications and a multitude of other electrical requirements.

Our ability to build is an asset to our defense. We are fortunate to be able to count on the reserves of talent and equipment it provides.





A diesel electric set climbs aboard an Air Force C-124 Globemaster. Loaded at Chanute Air Force Base, Ill., it was supplying electric power at Thule Air Force Base, Greenland, the next day.

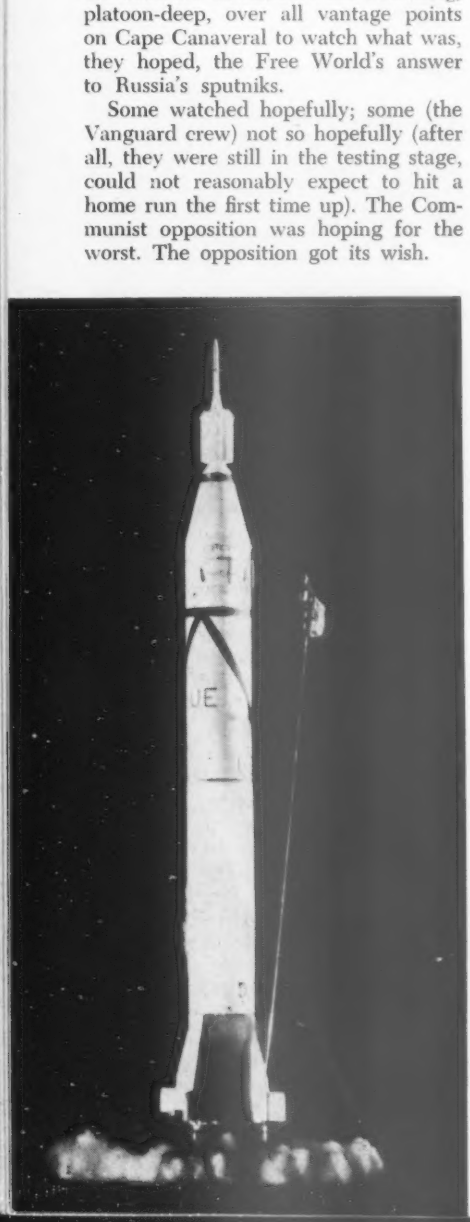
The Other Side of the Missile Story

Interservice rivalry has been the chief cause, say critics, for "our lag in the missile race." Just what is interservice rivalry? Is the charge justified? Here for the first time is the military answer . . .

by Bill Borklund

DECEMBER 6, 1957, was a fairly good day, weatherwise, for a missile test. It was a little cool as Florida weather goes. This had not prevented hundreds of military scientists, technicians, Cocoa Beach residents and the Nation's newsmen from swarming, platoon-deep, over all vantage points on Cape Canaveral to watch what was, they hoped, the Free World's answer to Russia's sputniks.

Some watched hopefully; some (the Vanguard crew) not so hopefully (after all, they were still in the testing stage, could not reasonably expect to hit a home run the first time up). The Communist opposition was hoping for the worst. The opposition got its wish.



Army's Jupiter C, the satellite launcher, is powered by rocket engines originally developed by North American Aviation for the Air Force.

Vanguard, its nose cone looking remarkably like a dunce cap, could not even get off the launching pad, instead exploded in a huge red and black fireball, keeled over and died in its own blazing fuel. The explosion rocked the entire Air Force Missile Test Center, but is was as a pin dropping compared to the cacophony unleashed on missilemen by Congress, the press and the U.S. Public.

Missile "experts" popped up overnight like mushrooms, roared out loud and clear about what should have been done and wasn't. Prime among their targets, and most used because the "experts" were rarely asked for specific proof, was the "uncontrolled interservice rivalry." Shaken by what they thought they had seen, an uninformed public began looking for a scapegoat. By not delving too deeply into the problem, they managed to build a pretty good case against interservice rivalry.

Charged with this crime, military and civilian missilemen have become angry, confused, frustrated. To the men developing our Nation's missile defense, such a charge is about as accurate as saying the New York Yankees would have a much better ball club if the second string quit trying to beat the first team out of a job.

Recently, a reporter asked Maj. Gen. Donald N. Yates, commander of the Air Force Missile Test Center at Cape Canaveral, if interservice rivalry was hurting our missile program. With an impatient wave of his hand, General Yates snapped, "We don't have anything but very good rivalry between the services down here. You go ahead and ask Washington about that."

Added one of his key assistants, an Air Force brigadier general, "We don't care who the missile belongs to. Our job is to get them up there."

Those two remarks are clues to the real story of our missile affort—a story which has been unjustifiably ignored in preference to the apparently more "newsworthy" back-fence tongue-wagging about service fights.

Strangely enough, the Vanguard* is one of the best examples, of hundreds, that Yates is right.

For example: immediately after the December 6 Vanguard blowup, the Air Force (which commands the test center), Pan American Airways (which runs Cape Canaveral under Air Force contract) and Loewy-Hydropress (prime contractor for the Vanguard launch stand) had crews swarming over the stand to repair it as soon as possible. Result: another Vanguard was ready to go up on the stand eight days later—far sooner then it would have been if the Navy was left strictly to its own devices.

In addition, during a recent Vanguard test a pump failure was preventing UDMH (Unsymmetrical Di-Methyl Hydrazine) fuel from being delivered to its tank in the Vanguard rocket. With time running out, the test was in danger of being cancelled unless a replacement pump could be found. One was—courtesy the Thor (Air Force) missile project nearby. Thor people have also furnished a "cherry picker" (portable crane) which Vanguard Operations Group has used several times to correct troubles in the second and third stages of the rocket.

Army personnel are using Naval Research Laboratory facilities to track their Explorer satellites. The Army has furnished DOVAP (Doppler Velocity and Position) support† for the Vanguard program in practically all

** Although Vanguard really shouldn't be included in any missile discussion. Its only connection with the military missile program is the use Vanguard people have made of military know-how and facilities to carry out their project.*

†That is, they have operated a ground transmitter and a series of ground receiving stations which keep track of Vanguard's position and velocity.

launches of the rocket. These Army people are members of the Army Ballistic Missile Agency. If there was really a war going on between the services, why hasn't the Army rested on its hands when someone mentioned Vanguard?

One more note on satellites: the Army Explorer had one experiment completely designed, built and tested by the Cambridge Research Center, an Air Force installation.

But satellite firings are not, in the present state of the art, a primary concern of the Military. Long-range ballistic missiles are. And, like nearly all other facets of the missile business, interservice rivalry is not a clean-cut, black-and-white situation.

It exists on two levels. At one level it is a fight for service survival. Here, in the corridors of the Pentagon, it means partisan political maneuvering and is the fountainhead for all the damning charges in the Nation's press. It revolves around a battle for budget dollars. It is a built-in part of the Defense Department organization—and is the primary reason military men shudder when assigned to the Pentagon, sigh with relief when transferred.

Congress has set up separate little packages—Army, Navy, Air Force—each administered at the top management level by a civilian staff. (Army, for instance, has only about 3000 military assigned to Army headquarters in the Pentagon, carries more than three times this many civilians on its Pentagon payroll).

There is no single staff responsible for seeing that all three services' capabilities to fight are maintained. Because of this, a particular service which can't get the decision it wants at the Secretary-of-Defense level fights its battle in the press. However, this is true *only* at the top management level. (Whenever Army, Navy and Air Force have been put on a single project with a single chief, cooperation, help, etc., have been complete in all cases with no fights).

A single military service, moreover, is no solution. The Navy's Bureau of Ordnance and Bureau of Aeronautics have had missile fights just as bitter as the Army Jupiter-Air Force Thor controversy. They haven't been publicized, largely because both bureaus have the same boss, Secretary of the Navy Thomas S. Gates, Jr.

At the second level, among the men actually developing missiles, rivalry is a competitive effort resulting from pride in their own technical capabilities. At this level, contrary to popular belief, it is one of the most outstanding assets of our entire missile effort. For instance, Douglas Aircraft Company, prime contractor on the Thor IRBM, did not push the Thor project hard because it had priority. The real push came because they were in a race with Dr. Wernher von Braun and his Army team at Huntsville. Because of the same race, the Army states quite frankly its Jupiter is going to be ready one year sooner than it might have been.

The chief concern of William Holaday, Defense Department director for guided missiles, and his staff is to see that the political squabbles do not get down to the working level. This points up a significant fact. The decisions to allow rivalry to continue are management problems exclusively. They have nothing to do with technical effort.

Duplication of projects has been pointed to as the hallmark of debilitated military missile effort. This charge grows out of a common misunderstanding both in Congress and among the U.S. people of just how our Defense Department operates. It ignores several very vital, over-riding reasons why an apparent duplication of effort must continue.

The misunderstanding is the direct result of a public assumption that the services are all working for the same outfit. In actual fact, they are really like three separate businesses engaged in a similar type of work. It is too often overlooked that the services need different systems (because of their different environments—land, sea and air) to accomplish similar military jobs. Each of them needs different ways to fight. Putting all their eggs in one basket would make it much easier for a potential enemy to come up with a defense.

This misunderstanding in the public mind probably never will be completely straightened out. The very nature of the animal makes it extremely difficult. (If we disclose publicly the different jobs two similar missiles are designed to handle, we give a potential enemy the chance to develop counter-weapons. So the missiles are cloaked in secrecy. The only allowable description must, of necessity, be oversimplified, ends up in the press looking like the same missile being fought over by two different services.)

The reasons duplication should continue are varied, but sound.

1.—The motivation of people generated by pride of accomplishment. Competition on similar projects can work for the taxpayer just as well as it does for the private consumer. Why is there this idea in Congress and the public mind that it cannot?

2.—In 1949 a triservice board (without the aid of civilian kibitzers) set up a balanced missile program. The only technical redundancy—*i.e.*, duplication—occurred where the services had no technical assurance of success. In other words, duplication is straight insurance on programs. When there is reasonable assurance that one particular program will produce the hardware needed, the insurance projects are cancelled. (Jupiter and Thor, because of the vital need for an IRBM, have both been ordered clear up to the production line to avoid all chance of an error in judgement). When backups to the main project are cancelled, the wails come from the cancelled projects.

Air Force F104A carries wingtip-installed Sidewinder guided missiles, which AF buys from the Navy.

3.—According to top Pentagon brass, there has never been a time lapse of more than two years since 1949 when the missile program wasn't restudied—never been a duplication that was not justified.

4.—Decisions to keep programs are made at the top of the military structure. The Defense Department has learned it may cost only $50,000 for an artist to draw a model and present specifications, will take upwards of a quarter-billion dollars to get a result—and still there is no return on the investment until the missile is operational. In the meantime, there are plenty of people in the military—the

comptroller, others who would like to have the money—to see to it that those responsible for a program can continually justify it.

5.—A single organization for military research and development is a highly ungratifying answer to R&D duplication, if the British Ministry of Supply is any criterion. It is an organization independent of their Ministry of Defense, has been in existence for a number of years. *Today, Great Britain's armed services have no effective weapons that are a product of the Ministry of Supply.* To be sure, they have much cleaner programs than the U.S. and, on paper, much nicer setups. But we are farther down the missile road because of our groups each has motivation. We don't tie the projects up in such a nice, neat package, but we get more done faster because the people have drive.

Actually, any charge that interservice rivalry is sabotaging our missile program could be made to stick only if critics could prove one of three things:

Each service could and would withhold information from the other two;

Technical skills, the pool of scientific talent is diluted by so many different projects;

Specific requirements of one service are given such emphasis that the benefit of mutuality is sacrificed, *i.e.*, one service gets all it needs and the other two get their heads chopped off.

Any man connected with military missile development is capable of categorically hacking these contentions to shreds—if he had the time and if anyone bothered to ask him.

Here are a few specific examples.

Withhold Information?

The Armed Services Technical Information Agency (ASTIA) is a tri-service central library, under Air Force management, which collects and disseminates for use of all the services all technical information up through the Secret classification. (The highest area of classified information, Top Secret, is not, by definition, involved in this type of thing and the amount of technical missile information classified Top Secret is minute).

Top civilian Defense management approves or disapproves of projects separate services might want to try. This creates a need for one service to know what another is doing to prevent proposing an unjustified duplication of effort. Each service makes a thorough study of its sisters' projects to see if, with a minor change or so, they can be adapted to its own requirement. (The rocket engines which propel Jupiter for the Army were originally developed by North American Aviation Co. for the Air Force Thor. The Army learned from the Air Force what the engines could do, requested and received the same engine with variations to fit their own missile.)

The services frequently let jointly funded contracts to industry or universities, have equal access to the study results. Examples: the material laboratory and electronics laboratory at Massachusetts Institute of Technology; the advisory group on electronic tubes at New York University; the advisory group on electronic parts at University of Pennsylvania; and Army-Navy jointly funded lab studies of improved solid-propellant rocket grains and production methods. Each prepares a joint service catalog to circulate its information to all services.

There is a complete exchange of liaison officers at all major installations. The Air Force, for instance, has a man working with the Army Ballistic Missile Agency on the Jupiter program. He has to-the-minute knowledge of all the Army is doing on the project. The same is true (in reverse) on the Thor, also occurs on all the "nonheadline" missiles such as Navy Sidewinder and Talos, Army Corporal, Air Force Snark and Matador.

A Navy man working on the solid-propellant Polaris missile wrote the bulk of the material used by the Air Force to justify their Minuteman.

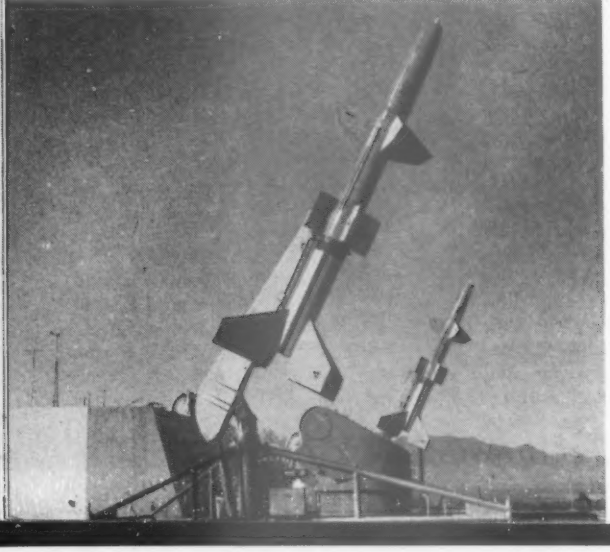
The major test centers, such as White Sands Proving Ground, Point Mugu and Cape Canaveral, are, in actual operation, run by all three services. WSPG is Army-managed, Point Mugu is Navy, Canaveral has an Air Force commander, but in each case staff advisors come from the other two services. These men (as well as the technical liaison officers assigned to specific missile projects) file with their own services through the base commander reports of what is going on in the other services. So, the Navy, for instance, not only knows what the Air Force is doing; the Air Force also knows what the Navy says the Air Force is doing. It's hard to see how an exchange of information can be much more complete than that.

Dilute Technical Skills?

In approaching a particular missile problem, the scientists do not know the best solution. They have to experiment. These are research and development people, not manufacturers of proven machines. If two separate services did not try separate approaches to the same problem, a single service with sole responsibility would have to try both approaches itself. Net result, oversimplified: one service would need all the scientists, the other wouldn't need any—but the need for technical skill would be just as great.

(In the Thor-Jupiter effort, for instance, there were four different approaches to solve the guidance problem, two by each service. If Jupiter had been cancelled, the Air Force would have had to try all four to be sure it had the best one. This meant either it would have needed the Army missile team's help anyway or it would have been required to try one, cancel it and try the next—because of a limitation of manpower—until it came up with the answer. This would be fine if we had forever to come up with an operational missile. Sputniks I, II and III indicate we don't have.)

In addition, all three services have demonstrated they are quite willing to buy the hardware developed by another service's scientists, or for that matter rent the technical skill outright. The top men on missile projects have emphasized time and again, although it rarely is publicized, that no service has a monopoly on technical know-how. Said Admiral Raborn, head of the Navy's Polaris project, "Anyone who says one service can do the whole job better than any of the other two is either unintelligent, uninformed or irrationally biased toward his own particular branch."



Navy's Talos missile now has a land-based version, shown here. Army adopted the weapon as a result of evaluation tests it asked Navy to conduct on the missile.

The list of examples of technical skill exchange is almost inexhaustible, far longer than the substantiated charges of rivalry. Ticking off just a few:

Nike-Ajax (Army) and Terrier (Navy) missiles use identical propellant grains. Fuel was developed as joint Army-Navy effort; propellant is in production at both the Naval Powder Factory and the Army's Radford Arsenal.

Navy is presently working on improvements to Honest John, Little John, and Nike-Ajax motors. All are Army missiles.

The Air Force used a Sergeant (Army) missile for one of its nose-cone re-entry tests.

All three services played a large part in recovering the Jupiter nose cone displayed so -prominently by President Eisenhower last October (during his TV speech to an American public in an emotional shudder over Sputnik I). The Army's missile chief, Maj. Gen. John B. Medaris, even appointed a Navy man as one of his chief assistants on the project.

Navy men are being trained by the Army in certain aspects of missile handlings as are Air Force Jupiter crews.

At the Army's request, the Navy test-fired its Talos missile in a land-based environment. The Army, as a direct result, is now incorporating the missile into its arsenal. The Army has conducted its own initial tests under Navy guidance.

All three services frequently buy the same or similar missile components from the same manufacturer—based on the information they received from their sister service about how the product performs.

The Air Force is buying the Sidewinder (Navy missile) almost outright. AF has even furnished money and aircraft for Navy use in Sidewinder research. Because of information exchange, the Air Force knew where the program was going as soon as the Navy did, furnished money at the tail-end of the research-and-development effort to keep it moving. This cooperative effort has made the missile cheaper because the combined purchase is greater.

The Navy must plan Sidewinder production to fill the requirements of both services for the missile's use in peace and war. In addition, each service provides the other with a data summary each time it fires one of the missiles. (The Air Force and Army do the same thing each time one or the other fires a Thor or Jupiter).

The Navy is using the Air Force X-17 test missile to test components for the Polaris. All test-firing to date for Polaris used rocket motors made at the Army's Redstone Arsenal.

One Service Short-changed?

By disproving the first two charges of what interservice rivalry is doing to the missile program, the third is, almost by deduction, answered too. With this vast amount of exchange of information and technical skills (only a keyhole portion of which has been noted here), it follows necessarily that there is certainly very little feeling at the working level—where all our missile hardware is actually being developed—that one service is more important than another. Put another way, if the feeling exists, it has not affected work on the hardware.

In a recent study for Maj. Gen. John P. Daley, Army director of special weapons, the Army Ballistic Missile Committee found no examples in surface-to-surface missile development (Jupiter, Thor) where research-and-development progress was hindered or delayed by service rivalvy. This is a direct contradiction of the scorching headlines last fall when Col. Nickerson, *et al*, splashed the Jupiter-Thor controversy all over the Nation's press.

Often critics compare our missile effort with Russia's, saying in essence that Russia runs a much better program because they have no competition. In reality their system is highly competitive. In Russia, a producing scientist lives a life of comparative ease. The more he produces, the better he lives. A nonproducing scientist ends up chopping rocks in Siberia. This is motivation in its most basic form.

A Navy scientist, disgusted by slipshod press reports of this whole interservice controversy, asked recently, "Why is it Congress debates, the Supreme Court deliberates, but the Services bicker?" He was voicing a feeling prevalent among the men building our missiles.

To paraphrase a retired Air Force colonel, who spent nearly his whole career in the thick of the missile business: The only tangible product of this continuous flow of misinformation is a steady exodus of highly trained and devoted technical officers from the military service at a rate which should be ten times more alarming to the U.S. public than the current success of the Soviet propaganda campaign.

He was backed up recently by Air Force Major General Bernard A. Schriever, chief of the Air Force Ballistic Missiles Division. Immediately after Sputnik, Senator Lyndon Johnson and his Senate Prepardedness Subcommittee were busy grilling the Defense Department (and making the most of the resultant headlines) on "why the U.S. missile lag?"

Senator Johnson asked—What can we do to get on with this missile job?

Answered General Schriever—The best thing you could do would be to cancel this committee investigation and let my technical people get back to work.

What They've Said About Rivalry

Air Force Secretary James H. Douglas: *"The structural studies and airframe developments in the Air Force's Thor missile have been utilized by the Army to modify the airframe of the Army's Jupiter missile. Similarly, information revealed by Jupiter tests has provided data useful to the Thor program."*

Navy Assistant Secretary for Air Garrison Norton: *"The Air Force, Army and Navy have been working very closely on the matter of solid-propellant development with full exchange of information between the three Services. Furthermore, the Navy is tremendously indebted to both the Army and the Air Force in the matter of the guidance of the Polaris. And, there again, there has been a full exchange."*

Dr. John Hagen, director of the Vanguard project: *"The Vanguard has always been a tri-Service project."*

Admiral Arleigh A. Burke, Chief of Naval Operations: *"We use many of the components in our missiles which have been developed by the other Services. There has been very close interservice cooperation in all missile programs."*

General Maxwell D. Taylor, Chief of Staff, U.S. Army: *"One hears much about interservice rivalry these days and its baneful effect upon our defense efforts. Personally, I do not know any responsible leader of our military forces who will not concede at once that no single Service can defend the United States. It is a team job to which every Service makes a significant and indispensable contribution."*

Air Force Bothered By Increasing Costs

Growing concern of the Air Force **over increasing costs of ground support equipment,** due to greater complexities of air weapons and introduction of missiles, was expressed last week by **Brig. Gen. George E. Keeler, Jr.**

Keeler, deputy director of supply at Air Materiel Command headquarters, voiced Air Force concern to a one-day Industry-Air Force Ground Support Equipment Conference. "The Air Force buys more than one billion dollars worth of new ground support equipment each year," he said. "A program of this magnitude warrants that the best managerial attention be directed toward it."

Purpose of the conference was to work with industry on methods to assure the incorporation of Air Force in-service items in the development of weapon systems, and to determine the best method of eliminating duplicate development of items that could be used on two or more weapon systems.

T. G. Haertel of the industry planning service, Aircraft Industries Association, told the conferees that in order to evaluate equipment for suitability in a weapon system, the contractors need to know: (1) technical description of the item; (2) operational performance and applicational data; (3) status of functional evaluation and/or history of development; (4) illustration of the item; (5) manufacturers' names and identifying numbers; and (6) status of availability in Air Force stocks.

Defense Electronics Buying to Boom

The Armed Services will spend an estimated record total of **$4 1/3 billion** on **"electronic defense"** this year, including some projects widely regarded as "impossible" only a short time ago, predicts **Don G. Mitchell,** chairman and president of **Sylvania Electric Products, Inc.**

Speaking at the formal opening of Sylvania's new Amherst Engineering Lab, Williamsville, N.Y., Mitchell estimated 1958 defense business of the electronics industry "would exceed the industry's total in all civilian and military fields only 10 years ago." He attributed the record-breaking level to "amazing scientific breakthroughs" in such technical areas as missile and antimissile systems; "electronic shields," which would baffle enemy radar guiding missiles against jet bombers; electronic detection and warning systems; "counter-countermeasures," and other electronic defense activities.

Army QM Develops New Aerial Delivery

A new aerial delivery system, designed to facilitate more efficient and economical **delivery of heavy equipment to troops by parachute,** has been developed by the **U.S. Army Quartermaster Corps.**

The system involves a new type "drop kit," including an expendable platform made of plywood and honeycombed paperboard. The new kit costs about one-tenth as much as the present type of kits and weighs about one-half as much. In addition, it can be fabricated quickly on the spot to fit an individual item of equipment.

The new system, developed by the **Quartermaster Field Evaluation Agency, Ft. Lee, Va.,** is now undergoing extensive **static tests** at the Engineer Research and Development Laboratories, **Ft. Belvoir.**

New Army aerial delivery system, platform shown here beneath a jeep, doubles maximum safe rate of descent (to from 45 to 55 feet per second), requires fewer cargo chutes —which cost $1200 each and frequently are nonrecoverable after one airdrop.

How White Sands Uses Small Computer

The new machine was switched on at 8 a. m. shortly after the staff of the huge **Missile Flight Simulation Laboratory at White Sands Proving Ground, N.M.,** started work. By 10 a. m. its electric typewriter had spewed out 10 yards of paper inscribed in the language of digital computers. It hummed to a halt, the red "stop" key glowed, and the problem was solved.

It took just two hours for this compact electronic "brain" to fire 35 separate missile flights mathematically and calculate the air effects at the different flight speeds—a tedious task that would have taken 10 full weeks of steady work by an experienced operator at a desk calculating machine.

By the standards of the bustling Flight Simulation Laboratory at this key U.S. missile research center in the mountain-encircled desert of southern New Mexico, the problem was a small one. But because the base's two mammoth digital computers and large analog device are constantly committed, completion of such a problem would have been greatly delayed. Besides, it was an experimental analysis, the sort of untested suspicion that lurks in a mathematician's head—and remains there at a time when the urgency of going data reduction has the big computers tied up around the clock.

To fill the gap between the monumental chore of pencil-and-paper calculations and the demanding schedule of the giant computers that fill 50-60-foot rooms, White Sands selected one of the new small computers, a compact instrument about the size and shape of a home deep freezer.

The "handyman" computer took a load off the busy big "brains" in several ways. First, it could take care of small problems which, small as they are, can still tie up the large computers and usually require the same tedious programming as major evaluations. Second, it could handle the experimental sort of problem that would otherwise not even be attempted. By permitting these experiments, it performs its third work-saving chore: it

establishes the patterns, or formulas, for new mathematical curves and thus saves one of the largest time-consuming factors in automatic computing.

"We can afford to waste time, you might say, now that we've got the small computer," one mathematician explained. "We can work out our theories in a fraction of the time it would take us by hand, and every once in a while the theory works out. And that means a more efficient operation when we get to the big computers."

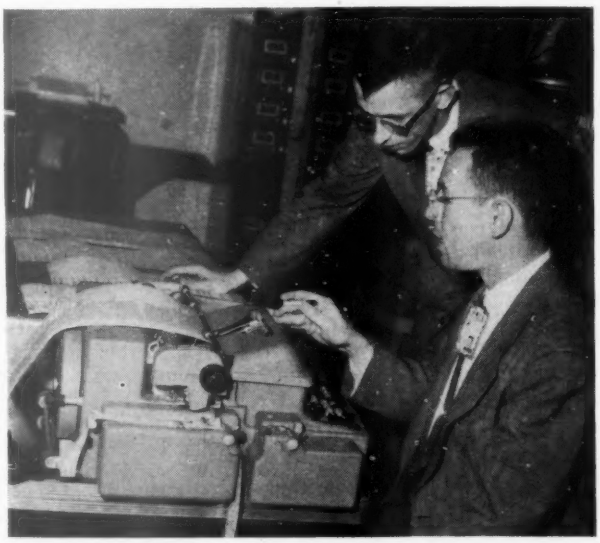
A further advantage of the small computer in a big operation like this one at White Sands is the machine's simplicity of operation. Compared to the giant computers, operators are easy to train. Mathematicians themselves, long used to spending hours explaining their problem to a technician so that it could be translated into computer language, can now go directly to the small computer and tell it their problem without this time-taking middleman operation.

"You might say that we are something like a big sawmill," explained a numerical analyst in the laboratory. "We have the equipment to handle big problems, just as a sawmill has the big machinery that can cut thousands of board feet of lumber. But suppose you want to cut just one plank to a certain size. It would take you a half hour to line up your big machinery. You could do the job in a jiffy with an electric handsaw. That's what our small computer is like . . . an electric handsaw."

"Yes," said another, a physicist, "and without the small computer you would have to do the problem by hand. That would be like having to use a pocket knife to whittle out that same plank."

Because of its "workhorse" status and its continual use as a sort of proving ground in itself for the often-theoretical evaluations that frequently use the same basic ideas, the small computer was selected by mathematicians at White Sands. Particularly valuable, they said, was its nonvolatile memory, a magnetic-drum principle which can retain instructions or data permanently.

By working out preliminary problems and smoothing the way for the large equations that are fed into the big computers, the new small machine is an important addition to the complex flight simulation branch at this, America's first missile research center. Missiles here are "flown" as many as 50 times mathematically for every time they actually roar into the clear blue skies overhead. Ideas are born and junked on the basis of the "number logic" of this highly important branch, and the costly business of real firings is cut to the bone.

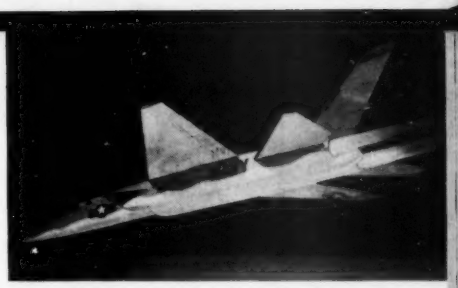


Two White Sands mathematicians "fly a missile" mathematically on one of the new small computers designed for "in-between" jobs at the Flight Simulation Laboratory.

Navy Unveils New Jet

The Navy's newest and most advanced attack aircraft, the A3J, was unveiled in ceremonies at **North American Aviation's** Columbus, Ohio, plant, where the plane is being built.

Described as a **very fast twin-jet attack weapon system,** the A3J is the first plane produced by North American under the weapon-system management concept. This means North American is responsible for the entire production including various components. This method concentrates authority in one "system manager," who is responsible to the appropriate military service for the entire project.



The A3J, first North American plane built under weapon-system management concept.

The A3J, says the Navy, will provide the fleet with an all-weather, carrier-based attack weapon system capable of delivering special weapons on difficult targets at supersonic speeds. A pilot and bombardier-navigator make up the crew of the aircraft, which is powered by two General Electric J79-2 jet engines, with more than 24,000-lbs. thrust.

Air Force Logistics Support Methods to Change

Air Force headquarters plans, with the adoption of modern logistic support methods, **to phase down the Air Materiel Command's** large **supply and maintenance facilities in Europe.**

Action represents a major change in logistic support methods because Air Force units in Europe will now order most of their supplies direct from Air Materiel Command depots in this country. Up to this time, Air Force has maintained large stockpiles of supplies at its oversea depots. Such stockpiles have been costly to maintain, and also became obsolete quickly because of the rapidly changing nature of weapons.

Air Force stated the phasedown of depots is possible because of improved communications and data-processing techniques, high-speed transportation and extensive use of maintenance contractor facilities in foreign countries.

Air Force Plans More Sage & Bomarc Sites

Air Force has requested funds in FY 59 military construction bill, recently submitted to Congress, **to build Semi-Automatic Ground Environment System** facilities at five U.S. sites.

SAGE, part of Continental Air Defense system, provides automatic processing of air surveillance information taken from radar detection stations, as well as providing control and direction of fighter interception aircraft and guided missiles.

Construction sites, each costing in excess of $6.5 million, are: Albuquerque Area, New Mexico; Robins AFB,

Ga.; Seymour Johnson AFB, North Carolina; Sioux City Municipal Airport, Iowa; and Webb AFB, Tex.

Congress has already authorized a $122-million expenditure for construction of 10 Bomarc missile facilities. Sites, each costing between $10 and 13.5 million, include: Cooke and Travis AFBs, Calif.; Kinross AFB, Mich.; Paine AFB, Wash.; Ethan Allen AFB, Vt.; Camp Adair, Ore.; and spots near Langley AFB, Va.; Niagara Falls, N.Y.; Truax Field, Wisc.; and Duluth Municipal Airport, Minn.

Jet Fuel Pipeline To Service Hunter

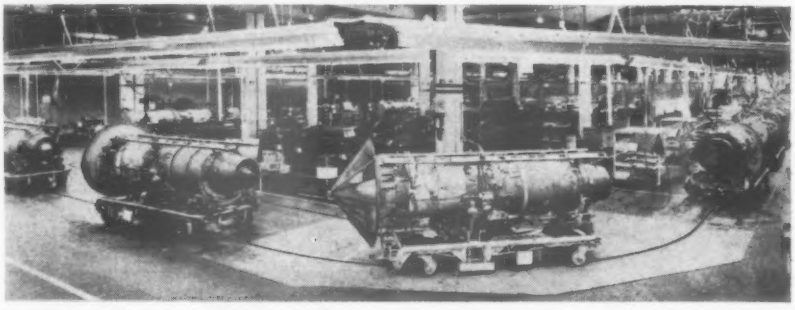
Construction of the first **jet-fuel pipeline** to service the entire fuel requirements of **Hunter Air Force Base,** just outside Savannah, Ga., is nearing completion.

The new six-inch pipeline, approximately 9.5 miles in length, will cut across Savannah in a southwesterly direction to serve the Air Force a minimum of approximately 300,000 gallons of jet fuel per day.

The $300-thousand-plus pipeline will be administered and operated by the Georgia Port Authority on a fee-and-royalty basis.

New Jet Overhaul Uses Kit Concept

A new system for jet engine service and overhaul which features use of conveyorized production-line concepts has been developed by **Pesco Products Div., Borg-Warner Corp.**



The Pesco system is designed to eliminate up to 50% of material handling normally associated with jet-engine disassembly and assembly operations. Simplified tooling forms the basis for the new system and, with minor modifications, basic tooling will accommodate all jet engine models.

Systems planning of the entire overhaul operation permits the application of assembly-line techniques based on proven basic principles. System consists of parallel conveyorized assembly drag line and parts line. The assembly dolly and its related parts carriers travel at the same speed. Parts are grouped in "kits," each kit containing all parts necessary for complete assembly of a major component or subassembly.

Navy Tightens Expenditure Controls

First real sign of tight expenditure controls still being maintained by the Bureau of the Budget and the Secretary of Defense is **appearing in Navy proposals** for amendment of existing contracts.

Navy is asking contractors, particularly those of the Bureau of Aeronautics, to accept an amendment which provides: "The contractor agrees that invoices exceeding $100,000 will not be submitted between April 1 and June 30, 1958." The rest of the fine print describes what contractors can do to collect their excess billings after July 1. The Navy action has all the earmarks of a similar move made by the Air Force during last summer's economy wave.

Commerce Proposes New Budget Plan

U.S. Chamber of Commerce has proposed to House Appropriations Committee an entirely different method of appropriating military funds.

All defense funds, under the proposal, would be appropriated on the basis of military activities and programs, rather than provided for the separate Armed Services. Commerce has suggested that instead of earmarking funds for Army, Navy and Air Force, they be tagged for: procurement and production of military weapons and equipment; military personnel; construction of military facilities; research and development; maintenance and operation; and departmental administration.

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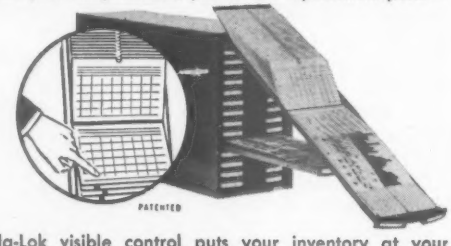

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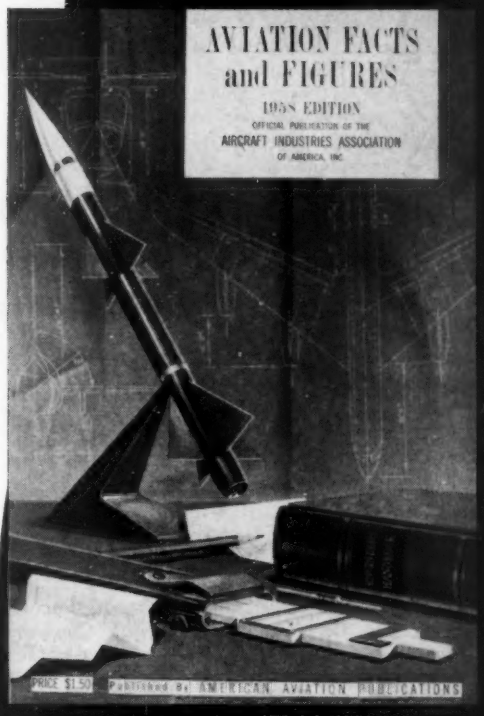

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The Uncertain Trumpet

by George Fielding Eliot

THE military services of the United States—the Army, Navy, Marine Corps and Air Force—are creatures of the Constitution and the laws. Like the Constitution and the laws, they are also historical growths. Their development from their earliest beginnings to their present status is woven into the warp and woof of the nation's history. They are spiritual and social as well as legal entities. They are the product of the legislative process, depending upon the sanction of law—that is, of public acceptance and consent—for their existence and their sustenance. But they are also the product of our national experience, shaped by past necessities as well as present anxieties, shaped also by the facts of geography and of ever-widening military frontiers. Finally—and fundamentally—they are the product of the eternal instinct of our people for self-preservation: preservation not only of material security but also of the life-principles of human liberty which were cherished by our forefathers, written into our Constitution, and which today the name of our country symbolizes to much of mankind.

High among these principles is the supremacy of the civil authority over the military forces of the nation. This principle is so much a part of the bone and sinew of our social organism that its effect on military participation in the formulation of national policy decisions in these troubled times is sometimes—like other familiar and accepted circumstances—overlooked by non-military students of this problem.

A moment's reflection makes crystal clear the over-riding responsibility of the civilian leadership for errors or omissions in our military policy and the foreign policy it is intended to support. The Constitutional provisions giving Congress the power "to raise and support armies," "to provide and maintain a navy," and "to make rules for the government and regulation of the land and naval forces," and directing that "The President shall be the Commander in Chief of the Army and Navy of the United States" have, of course, resulted in the creation by law and by Presidential action of the necessary administrative organization to carry out these provisions and to exercise the civilian control of the armed forces thus established. In this area, at the summit of the governmental structure, decision-making is solely a civilian responsibility. In this area, the function of professional military officers cannot be executive, but only advisory.

"Diplomacy and strategy, political commitments and military power, are inseparable," observes the late Edward Meade Earle. "Unless this be recognized, foreign policy will be bankrupt. The very existence of a nation depends upon its concept of the national interest and the means by which the national interest is promoted; therefore it is imperative that its citizens understand the fundamentals of strategy. We do not have and do not wish to have a military class to whom these matters will be delegated with plenary powers. Our armed forces, including our officer corps, are recruited on a democratic basis. This is as it should be, since there is only one safe repository of the national security of a democratic state: the whole people."*

Existing law fully supports this concept of civilian responsibility for national policy in all its aspects. The National Security Council, required by law "to advise the President with respect to the integration of domestic, foreign and military policies relating to the national security so as to enable the military services and other departments and agencies of the government to cooperate more effectively in matters involving the national security," has an entirely civilian membership; the Chairman of the Joint Chiefs of Staff is usually present at N.S.C. meetings, in an advisory capacity and not as a member. The representative of military policy in the work of the National Security Council is—and should be—the Secretary of Defense. It is he who must, at this highest level of debate and decision on national policy, speak for the military element in those decisions.

The Joint Chiefs of Staff are charged by law with being "the principal mili-

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* *The Makers of Modern Strategy*—Introduction.

tary advisers to the President, the National Security Council and the Secretary of Defense." In that capacity, "subject to the authority and direction of the President and the Secretary of Defense," the Joint Chiefs are charged with the "preparation of strategic plans and provision for the strategic direction of the military forces," with "preparation of joint logistic plans," and with "review of major material and personnel requirements of the military forces in accordance with strategic and logistic plans."

It is clearly not the intent of Congress that the Joint Chiefs should perform these functions in a vacuum; the National Security Act of 1947, which contains the foregoing language, is the same Act which provides that the National Security Council shall "advise the President with respect to the integration of domestic, foreign and military policies . . . *so as to enable the military services and the other departments and agencies of the Government to cooperate more effectively in matters involving the national security.*" (Emphasis supplied.) Thus policy—in which an element of military advice has been duly considered—flows from the President, advised by the National Security Council; the Joint Chiefs of Staff advise as to the strategy required to implement the policy, and the forces necessary to make the strategy effective.

These facts are fundamental to all consideration of our military policy and of the military element in national policy decisions. The responsibility for these decisions is, let us repeat, primarily a civilian responsibility, in which the military advisers can be properly held to account only to the extent that it can be shown that (a) they were given a clear policy directive; (b) the advice they rendered to their superiors was accepted and incorporated into policy without substantial alteration for non-military reasons; (c) they enjoyed uninterrupted and direct contact with their superiors in the day-to-day execution of policy.

Unless *all* of these conditions can be established as facts, blame for policy deficiencies and failures obviously lies elsewhere than with the military chiefs.

For the last ten years, *none* of these conditions has prevailed.

Unhappily most Americans do not understand this situation. That is why, since the first "sputnik" advertised the scope of the Soviet ballistic missile program and wrote its warning across the horizon of the future, there has been a considerable public outcry of alarm which has focussed on the theme of "inter-service rivalry" as the chief cause of our failure to keep up with the Soviet Joneses.

"Inter-service rivalry" is, of course, a convenient escape-hatch for politicians in distress; an observation which is devoid of any partisan coloration, since the mistakes in civilian judgment which have resulted in our present military troubles have been shared by the Truman and Eisenhower administrations. However, the danger is very real—even though not imminent—and there is a grave need for prompt, effective, and even drastic steps to strengthen our military posture. These steps must be begun now, for what we do now will determine in large measure what we will have in the way of weapons and military personnel two or three years from now when the Soviet missile program will probably be reaching its peak strength.

It is, therefore, to the last degree unfortunate—indeed positively perilous—that public attention should be focussed on the alleged need for eliminating "inter-service rivalry" and on reorganization of the Joint Chiefs of Staff, rather than on the essential requirements for the reform of our military policy and its co-ordination with our national policy objectives.

Part of the present confusion has its origin in the very confidence with which the armed services are regarded by the average citizen. He is aware of the increasing danger inherent in the Soviet missile program. He wants this danger abated by suitable military counter-measures. He is increasingly impatient with the argument that we cannot afford the cost of effective counter-measures. He wants the voice of professional military judgment to be heard on this subject, and he is more and more prepared to see to it that when it is heard, its advice shall be heeded, at whatever cost. Therefore he feels let down—as by a trusted friend—when he is told that the heads of the military services cannot agree on what should be done, cannot because of "inter-service rivalry" come up with an accepted and effective national strategy.

Quite naturally, in his indignation, he lends an ear to suggestions of "knocking heads together" so we can "get on with the job."

What that anxious citizen is *not* being told is that nobody in the seats of authority has as yet defined just what the job is that we must be getting on with.

The root of our troubles is not lack of strategic planning, but *lack of a defined and accepted national objective toward which strategy can be oriented.*

The lack is not altogether the fault of the present or of past political Administrations. It finds its origin in the revolutionary readjustment in national attitudes brought about by the growing Soviet threat, by our forced assumption of the duties of leader and champion of the free world, and by the nuclear-jet-electronic revolution in weapons technology. Any one of these circumstances would in itself require a considerable period of readjustment and debate in an open society such as ours, where the major streams of national policy must always find their sources in majority understanding and

"May I play please?"

acceptance. The concurrent impact of all three of these tidal waves of change has shaken our society right down to the grassroots. It could hardly be otherwise: nor can we expect or even desire our political leadership to come up with fast and facile answers, much less to re-weave overnight the whole fabric of our national policy into a new pattern of purposeful achievement.

It is our misfortune that the political leadership of the Soviet Union has already woven their pattern of policy. They know exactly where they are going, or think they are going. They have a defined national objective—the domination of the world. They have a policy and a strategy for achieving that objective. They have a tried and—so far—successful tactical system for implementing their strategy.

That is why they are capable of retaining the initiative and of constantly confronting us with fresh problems, of forcing us to conform to their initiatives by improvisations, often too late and not always too successfully.

Our policy shortcomings are due largely to our slowness in accepting the fact of implacable Soviet hostility, a slowness in which official thought and action takes its coloration from popular reluctance to face unpleasant facts and to shoulder the burdens which such facts, once admitted, would necessarily impose. However, when the grim truth forces itself into the public consciousness, there is an immediate outcry of "Why wasn't something done about this?"—and, quite illogically, a tendency to blame the military—spurred on by politicians who should know better.

Not all of this clamor of criticism comes from political sources. Writers and commentators, scientists and educators share in it, and who so poor among them as to have no plan for reforming the leadership of our military establishment overnight? Reading and listening, one is reminded of the comment of Captain Cyril Falls, the brilliant British military critic, on military reporting during 1939-45: "One of the most striking characteristics of the commentaries upon the Second World War, whether written or spoken over the radio, has been the relative weakness of the most brilliant general publicists who have no military background. Some of these men are so quick-minded that they at once absorb every scrap of information coming their way, so intelligent that they sometimes think ahead of the professional military commentators. But there is always something lacking in their mental machinery, which occasionally produces misapprehensions or miscalculations fantastic to the mind tolerably at home upon these paths."

This is precisely where much of the present comment and analysis of our military problem falls down. Consider, for example, this passage from the report of the Special Studies Project of the Rockefeller Brothers Fund:

"The present organization and responsibilities of the Joint Chiefs of Staff preclude the development of a comprehensive and coherent strategic doctrine for the United States. Since each member of the Joint Chiefs except the Chairman is the senior officer of one of the military services . . . he often becomes an advocate of a service point of view rather than an over-all planner."

This idea that all our difficulties arise from lack of "a comprehensive and coherent strategic doctrine" has been developed at considerable length by Dr. Henry A. Kissinger of Harvard University, who is the Director of the Rockefeller Special Studies Group, in his recently published book, *Nuclear Weapons and Foreign Policy.*

To any mind "tolerably at home upon these paths" of strategy and military policy, the first question to be asked would be: "What is the overall national policy objective toward which the Chiefs of Staff have been required to direct their strategic planning?"

Such an objective, to the student of military affairs, is the essential prerequisite for the strategic planner. If he does not know what his political masters require of him, to what end does he plan?

This is just what our Chiefs of Staff do not know—or more properly know only in negative and defensive terms.

The basic requirement of American security is *not,* as Dr. Kissinger asserts, a strategic doctrine but *a defined and accepted national objective toward which strategy can be purposefully oriented.*

The theme of our current national policy vis-á-vis the Soviet Union is a double feature—deterrence and containment.

Deterrence has been otherwise described as a capacity for massive retaliation at times and places of our own choosing. It means simply the maintenance of a capacity for striking the vital centers of the Soviet Union with nuclear weapons, and the defense of our means of doing so against neutralization by surprise attack. This is, of course, the cornerstone of our security. To fail in this would be to fail in everything. But it is a negative policy by itself. If it is a cornerstone, it awaits an edifice of purpose to support.

Containment is the natural running-mate of deterrence. It involves preventing the expansion of Communist control over peoples and territories, at any rate by means of armed aggression. It includes such military dispositions as the presence of United States forces in Europe, the Mediterranean, and the Far East; military support and assistance for our allies and friends; and provision for the reinforcement by sea or air of overseas forces or allies in case of need. This, too, is a negative policy. It leaves the initiative to the enemy, a fact of which we have had all too many painful examples.

To the experienced military officer, a negative and defensive strategy is anathema, when the nation he serves is confronted by a vigorous and powerful enemy who makes no secret of his intention to "bury" every vestige of liberty and all that makes life worth living for free men and women. Tied to such a policy, confronted by such an enemy, the best that the military advisers of the Government can do is to keep up as best they can a "position in readiness," with such reserves of fighting force as they can squeeze out of the budget after providing for the deterring and containing forces above mentioned. Here, and here alone, is where anything resembling "inter-service rivalry" comes into the picture as a disturbing element.

Four of the five members of the Joint Chiefs of Staff are also the military chiefs of the four fighting services: Army, Navy, Marines, Air Force. Each of these officers wears two hats: a "collective" hat as a member of the JCS, responsible with his colleagues for military advice to the government and the preparation of joint strategic plans, and an individual hat as the military head of his own service, responsible in that capacity to his service Secretary (and to the nation) for its readiness for war. Since he has no idea of the intentions of the enemy, no idea of when or in what circumstances his service may be called upon to fight, and has no policy directive to prepare for any positive action other than to maintain the best level of readiness he can, he quite naturally tries to be ready for anything. He is tied to a policy of the strategic defensive. The training and experience of a lifetime have taught him that the best to be expected from the strategic defensive is to gain time, to defer a decision. To an experienced military man, this idea is instinctively associated with a future resumption of the offensive at a more favorable moment. A defensive attitude which has no apparent purpose except to prolong the *status quo* indefinitely cannot help but occasion deep anxiety to officers

who may be responsible for meeting enemy initiatives of unpredictable nature on very short notice—as was the case not so long ago in Korea.

Each service Chief, therefore, is desperately anxious to keep a reasonable amount of force in hand, uncommitted to any fixed purpose, with which to meet such an emergency. He has been taught all his life to hold out a reserve, especially on the defensive when he must be prepared for any move the enemy may make. But under the twin pressures of the budget ceiling and the fixed commitments to deterrence and containment, he finds it increasingly difficult to do this.

The budget "bite" hits each service in the same place—its reserve against emergencies.

The Army has its fixed commitments of five divisions in Europe and two in Korea, plus other overseas garrisons (*e.g.* Alaska, Panama) and its contribution to continental air defense; it is finding increased difficulty in keeping up a reasonable strategic reserve of ground troops in the continental United States.

The Marine Corps, with its fixed commitments in the Pacific and Mediterranean, its security and ship detachments, watches with anxiety the personnel strength of its home-based divisions and air wings.

The Navy must also maintain its overseas deployments in the Sixth and Seventh Fleets and a rising capacity for anti-submarine warfare; yet possible emergencies requiring the instant use of its mobile striking and amphibious forces based in home waters can never be absent from its planning.

The Air Force has its two major deterrent commands, the Strategic Air Command and the Continental Air Defense Command, plus the provision of tactical air support for the Army in Europe and Korea; a reserve of tactical air power at home, or the provision of strategic airlift for other services, are by necessity (but certainly not by choice) marginal requirements.

The members of the Joint Chiefs of Staff have little difficulty in agreeing on joint strategic plans to carry out the deterrent and containment missions imposed upon them by their political masters; but the margin of funds left after these commitments have been met—a margin further reduced by rising costs—is just not enough to allow each service to maintain, in addition, a reasonable reserve of mobile striking force against the unforeseen emergencies of the future. Anguished adjustments to this unpleasant fact are the source of most of the "inter-service disputes" that actually take place from time to time.

"And we must do away with interservice rivalry!"

Disputes of this type—which often originate at lower planning levels than the JCS—do not seriously interfere with the development of strategic plans to carry out defined policy objectives. They result at times in compromises satisfactory to no one, simply because after providing for the defined policy objectives, there is little left over for the reserve force which all the service Chiefs and every subordinate officer who has anything to do with strategic planning knows to be necessary. It is not a question of the Joint Chiefs failing to plan for limited war or sudden local enemy initiatives: it is a question of the political leadership refusing to provide enough money for both the fixed commitments and the uncertainties of the future. It is not a question of each service contending, as Dr. Kissinger asserts, that "a service can never possess a too varied capability" and a consequent tendency toward "proliferation of weapons systems" and a claim by each service "to develop a capability for total war."

It is a question of none of the services being able to keep a margin of uncommitted reserve strength against the unexpected, because they are tied firmly to a policy of waiting for the unexpected to happen and hoping it won't.

Dr. Kissinger understands this difficulty well enough in theory. His whole book is a plea for the development of a capability for limited as well as total war, for greater initiative in defining and seeking "intermediate objectives" of our own instead of constantly being surprised by enemy initiatives of this character. "In the process of defining our strategic interest," he observes, "we cannot avoid facing another fact of the nuclear age little in accord with our predilections; the difficulty, if not impossibility, of holding a perimeter of twenty thousand miles while always remaining on the defensive politically, militarily, and spiritually." No present or past member of the Joint Chiefs of Staff, we may be sure, would disagree with that statement. It is a pity that Dr. Kissinger does not see more clearly that as long as we are on the defensive politically and spiritually, we are certainly—under our constitutional system—going to remain on the defensive militarily also.

The best means of bringing about a change in the direction of a more active policy is the infusion of a greater content of professional military judgment into *policy decisions*—a greater reliance on the military instinct which always seeks, as Dr. Kissinger advises, a strategy "able to assess the forces which move contemporary events and find the means for shaping them in the desired direction." The most hopeful feature of the present turmoil over Soviet missiles is that out of it may come—for a time at least—a readjustment of the machinery of civilian decision-making which will provide for more direct and continuous contacts between the top-level civilian officials and their responsible military advisers, the Joint Chiefs of Staff.

If, however, military advice is to win greater acceptance whether from policy-makers or from the public at large, it must flow from the traditional sources which through the years have earned their right to the public confidence. It must flow from the organized professional opinion and doctrines of the armed services—the Army, Navy, Marines, and Air Force—and find its final expression through the responsible military chiefs of those

services. No organizational device based on weapons systems or arbitrary assignment of strategic missions can alter this fact, which is implicit in our history: the attempt to do so at a time of crisis such as the present would be perilous to the last degree. It is in our traditional and time-honored military services themselves, as living growths and elements of our society, that the public trust resides, not in individuals wearing the uniform—whose respective degrees of ability are but little known generally, whatever command might be assigned them. It was the broad current of service judgment and opinion, interpreted by chiefs such as Marshall and King, which gave us in World War II the most ably commanded forces America has ever sent into battle.

It is in failing to understand this fact, and accounting it a fault rather than a source of strength that the members of the Joint Chiefs of Staff are the products and the representatives of their several services, that Dr. Kissinger falls into his fundamental error, which he compounds by likewise overlooking the effect of professional tradition and principles.

Thus he seeks to equate the procedures of the National Security Council and those of the Joint Chiefs of Staff. "The officials comprising these bodies," he observes, "are either heads of military services in the case of the Joint Chiefs, or heads of executive departments in the case of the National Security Council. . . . Their thoughts run more naturally to administrative efficiency than to the elaboration of national objectives. In the committees where national policies are developed, they become negotiators rather than planners. . . . As a result, the conclusions of both the Joint Chiefs of Staff and the National Security Council reflect the attainable consensus among sovereign departments rather than a sense of direction."

This is true to some extent of the National Security Council, where the requirements of foreign policy, fiscal policy, and military policy must be reconciled. These requirements are, more often than not, sharply in conflict. The vigor of their respective advocates reflects not only personal ability in debate, but the skill with which each departmental case has been prepared in advance and steered through the long preliminaries at lower echelons of coordination before the final presentation, in which the President must unavoidably be the umpire and bear the heavy burden of ultimate decision. The men who take part in this debate are of varying experience in government. They are conditioned by these backgrounds, and the degree of their experience in government determines the extent to which they are dependent on their subordinates for effective performances.

The members of the Joint Chiefs of Staff, however, are all members of the same profession—the profession of arms. They have all spent their lifetimes in that one profession. They are equals in experience. They have reached the ultimate pinnacle of their chosen way of life through a tough process of selection based on performance. They are dedicated men, in whom love of country is the determining motivation. The writer, who has enjoyed some measure of personal acquaintance with almost every officer who has reached Chief of Staff level during the past quarter of a century, has no hesitation whatever in asserting that not one of these men could be imagined as hesitating to sacrifice the special interests of his service, or his career, or his very life, if convinced that the welfare of the United States required that sacrifice.

Each of these men knows that this is true of himself, and he knows that it is true of his colleagues. There exists a common ground on which to meet, to examine differing viewpoints, to reconcile these differences with the common purpose of the nation's safety. Of course each of these officers is the product of his own service. But behind each stretches out a long experience of working together with the other services, in war and peace. In the living memory of each is the fact that the Joint Chiefs of Staff system was hammered out on the anvil of World War II, born of urgent necessity: and that it conducted that war more efficiently than any other system of high military direction which the mind of man has ever produced, and brought it to a victorious conclusion unmarred, after the dread day of Pearl Harbor, by a single major defeat for American arms.

Since the close of the war, officers of the four armed services have been working together in the headquarters of joint or unified commands, in foreign military assistance groups, in all kinds of cooperative military enterprises ranging through the whole spectrum of military effort. They fought together again in Korea. They attended each other's war colleges, and joint institutions of higher military education (National War College, Industrial College of the Armed Forces, Armed Forces Staff College). No officer today rises to the high eminence of chief of his service without having participated in some of these experiences of interservice collaboration.

A man may become a Secretary of State or Defense without any previous experience whatever in political life or in the basic problems with which the department for which he is responsible must deal, much less those of the colleagues with whom he must debate the decision's of higher policy. A member of the Joint Chiefs of Staff has not only mastered the problems of his own service, he has a working acquaintance with the problems of all the others. He is not compelled, as a civilian Secretary may well be, to pick and choose the guide-lines of his policy from the advice of subordinates of unknown capabilities. Nor can he be given a "snow-job" by any of his colleagues: for he has had both a sound education and a lifetime of experience in applying the fundamental principles of strategy to the military art.

It is a distortion of fact to suggest that our system does not lead officers "to think naturally and spontaneously about the problems of greatest over-all concern," or to say that "this is impossible because there exists a mechanistic division of functions among our services which is growing increasingly unrealistic." The briefest of acquaintances with service periodicals should disabuse Dr. Kissinger of the idea that American officers of all the services and even in comparatively junior grades do not "think naturally and spontaneously about the problems of greatest over-all concern." There are a lot of officers on the Joint Staff, for instance, who spend their time doing nothing else, and in the process contributing to joint strategic plans and estimates.

Of course every officer begins his career with a somewhat narrower scope. When he becomes a second lieutenant or an ensign he is expected to perform the duties of that grade. His training has been oriented to that end. Without competent junior officers, the tactical units which are the essential instruments of any strategy, however charged with wisdom, could not function. The process of selection by which young officers rise to higher responsibilities and are eventually chosen for "thinking" jobs such as the Joint Staff may not be perfect, but it is a process intended and consciously directed toward the development of officers with a well-rounded experience and military education which shall fit them at each step in their careers for ever-broadening responsibilities. Indeed, it may be said that each of the armed services is in one sense a university, and in another a school of application; and to reach the level of knowledge and experience required to discharge acceptably the duties of its highest military rank demands the better part of a lifetime. The entire process requires, of course, the main-

tenance of a continuous balance between specialization and generalization: an Army officer, for example, may wear the crossed rifles of the Infantry through all the years he spends in the grades from second lieutenant to colonel. He may successively command a platoon, a company, and a battle group of that arm, but in between these periods of command duty he will be serving on staff assignments, attending schools and war colleges, and performing various other tasks which have little to do with the specific problems of his basic arm. It is the sum total of this experience which will finally count when the time comes to consider Colonel X. for promotion to general officer; and he will be lucky if he has a sufficient period of active service left to develop his full potential in the higher rank. It is difficult to see how a system of which the top-level product is and must be general or flag officers competent to command divisions, air (or missile) wings, and naval task forces and from whom commanders at even higher levels of responsibility can be sparingly chosen, can be organized in any radically different fashion, considering the long time-span required to develop this capacity for command.

When such an officer is selected for the highest command in his service—the position of Chief of Staff of the Army or the Air Force, Chief of Naval Operations, or Commandant of the Marine Corps—it is quite true that in the preparation of joint plans and joint military advice for his civilian superiors, he speaks for his service as well as himself. He is, indeed, the voice of his service's distilled experience of war and of preparation for war—the voice of a continuous evolution of American military thought, stretching right back to Saratoga and the sinking of the *Serapis*. Whatever useful contribution he may make to the national strategy is the product of this experience. Strategy does not, as Dr. Kissinger apparently supposes, spring full-armored, with a mighty battle-cry, from the heads of the Joint Chiefs of Staff like Minerva from the head of Jove. It cannot be divorced from the policy it serves; but neither can it be divorced from the tactics which are the means by which it seeks it ends.

"But, Mr. Secretary, you have to play the lead."

The services themselves are the nurseries of military thought and doctrine. It is within the services and through their constant association in the common task of providing for the common defense that the military contribution to our national strategy is developed, hand in hand with the tactics which must translate that strategy into the realm of action if called upon to do so. Nothing could be farther from the truth than Dr. Kissinger's view that this process tends to develop an air strategy, a ground strategy, a sea strategy which are independent and even contradictory of each other. He accuses the services of a "mechanistic" approach to strategy and yet falls into precisely this error himself. He calls for a common "strategic doctrine" and then develops this requirement in tactical terms. He makes a tremendous issue of "roles and missions" without ever perceiving that the roles and missions agreement is keyed to peacetime tasks of training and procurement, and would be the first document to land in the wastebasket if there was real fighting to be done.

Indeed, Dr. Kissinger confuses throughout the latter part of his book the subject of the national direction of war (or of national defense) and that of the conduct of military operations if war should come. How otherwise could he have conceived the curious rearrangement which he proposes for the Joint Chiefs of Staff? He suggests that this body be composed of a Chairman, a Chief of the Strategic Force (concerned with all-out war), and a Chief of the Tactical Force (concerned with limited war), together with the Chief of Naval Operations to represent, as Dr. Kissinger says, "operations such as anti-submarine warfare which do not fit into any of the above categories." The advantage claimed for this arrangement is that "such a group by its very nature would be more oriented toward doctrine than the present Joint Chiefs of Staff. The Chief of each Force would represent an integrated strategic mission and not a means of locomotion."

The "Strategic" and "Tactical" commands thus suggested are meant by Dr. Kissinger to include the whole of our fighting forces. "The Army, Navy and Air Force," he grants, "could continue as administrative and training units, much as the training commands *within* the various services operate today." The two forces are intended to be self-contained, with training, weapons systems, and doctrine appropriate to their respective missions. These, Dr. Kissinger believes, differ *basically*. Neither force should be used to support the other except that in all-out war it is admitted that the Tactical Force might be needed and "for such a purpose should come under the command of the Strategic Force."

To a "mind tolerably at home upon these paths," these suggestions border on the fantastic. They become no less so when considered in the light of Dr. Kissinger's supporting contention that their advantages are "demonstrated in that in every recent war we have set up joint commands reflecting the same basic concept. The new organization would create in peacetime the structure which the requirements of combat would impose upon us in any case." Advocates of a single Chief of Staff have diligently addressed themselves to what seems to them a

similar analogy—we need a single Commander in Chief in a theater of operations, therefore we need a single Chief of Staff in Washington.

Neither analogy is valid because the direction of military policy at the seat of government is *not* the same thing as the command of a theater of operations in war. Certainly in war we have created joint commands and have assigned thereto such Army, Navy, Marine, and Air Corps forces and such logistic resources as were necessary to enable the Comander in Chief to carry out his mission—within, of course, the limits of availability. In turn, within each such command, the Commander in Chief organized joint task forces, composed of units of two or more services, each under a single commander with a joint staff.

But these theater commands, these task forces, were tailored for an existing situation and required to carry out a specific mission with defined limitations of time and scope and against enemy forces of known characteristics and strength. Each commander thus had a strategic objective and was given tactical and logistic means to achieve it. The distinction between total and limited war was observed vertically rather than horizontally: to attain his ultimate objective, each commander might be required or decided on his own to undertake operations against limited or intermediate objectives. Limitations on his actions—either as to their nature, their timing or their location—might also be imposed for political reasons. But all the decisions and limitations which went into the composition of the directives given to theater commanders were the result of close collaboration between military and political chiefs at the seat of government who were able to take a broad view of the war, to "see it whole," and to have some understanding of the resources of all kinds which could be made available now and for the foreseeable future to accomplish the desired results.

It is just our habituation to this system of joint command in war which makes nonsense of any suggestion that a similar system be adopted for the higher direction of war or of military policy. The former is a purely military problem, to be solved on military lines. The latter is chiefly a political problem, into which the factor of military advice must be integrated. In a theater of operations, the Commander in Chief makes the final decisions. He does well to listen to the advice of his subordinate commanders and chief staff officers, but he does not have to. He and he alone is responsible to his superiors for the results obtained. He gets the credit for victory; he bears the blame of defeat. No military officer can hold an equivalent position at the seat of government. Authority and responsibility must—in the military profession above most others—be kept reasonably in balance. No military officer in Washington can be given the sole charge of our readiness for either total war or limited war, because he cannot be given the necessary *political* responsibility. This is why today the military chiefs of the services are the subordinates of their respective service Secretaries, upon whom a due measure of political responsibility can be imposed; and this is why the law makes the Joint Chiefs of Staff responsible for the giving of military advice to the President *and* the Secretary of Defense.

As to the proposed reallotment of missions between a Strategic Force and a Tactical Force, this idea appears to have been germinated by Dr. Kissinger's repeatedly stated conviction that the present division into four armed services is based on a "mechanistic" approach—that is, on their respective means of locomotion. This is not only incorrect, it is a concept which has been stoutly resisted by the services themselves. The idea of a sea, an air, and a land strategy, in military thinking, exists at all only in regard to *control of a given field of action*, and not to means and methods for doing so, which belong to tactics.

The purpose of the control of the battlefield, whether in the air, at sea, or on land, is to gain freedom of action for one's own forces and deny such freedom of action to the enemy. Experienced military officers do not suppose today that this can be accomplished by one service alone, or by each service seeking separately "to defeat its enemy counterpart." It is done by joint operations, directed by joint commands and employing joint task forces tailored to the operational requirements. Thus it might be thought that to command the North Atlantic sea-lanes was purely a naval responsibility; in fact it is a task in which the Navy has a primary interest, but in which both troops and Air Force units might well have to cooperate—for instance to hold base positions or drive the enemy from those he holds. Again, it might be thought that strategic bombardment is purely an Air Force responsibility; but outlying bases requiring garrisons and sea-borne access are essential to the discharge of that responsibility—and in this age of ballistic missiles designed by the Soviets for the express purpose of neutralizing or destroying the great airfields of the Strategic Air Command, who can say whether the American strategic bombardment force of the future may not be operated from moving bases upon which such missiles cannot be pinpointed: that is, from the aircraft carriers and missile-armed ships and submarines of the Navy?

American strategic thought today, far from being over-compartmented and cramped by technology, is devoted to the principle of flexibility. It cannot foresee the future in terms of trying to control and shape it, because it is tied to a defensive policy; so it tries to be ready (within the means allotted) for such emergencies as can be reasonably anticipated. If it were to be further strait-jacketed within two mission-type forces, each to be kept self-contained, and each directed to a particular form of war, either the system would break down altogether on the approach of an emergency, so that a new policy-command structure would have to be improvised in the teeth of a hostile assault, or we would initially meet the emergency with forces insufficient in numbers, in training, and in armaments to deal with it. No one could imagine future budgets which will put into a future Strategic Force everything that we might need for total war, and into a future Tactical Force everything that we might need for limited war. It is hard enough under the existing flexible system, which envisages joint commands and joint task forces for either kind of war tailored to the needs of the hour and trains its people accordingly, to produce a level of readiness for both. That this is possible at all is largely a matter of the prestige of the services involved—the Army, Marines, and Navy with some muted assistance from the Tactical Air Command of the Air Force. What the chances of the Chief of Dr. Kissinger's proposed Tactical Force would be of getting enough appropriations to keep him in business with no integrated service support behind him and the Army, Marines, and Navy reduced to the level of training outfits, may be left to the imagination of those with some experience of the present system.

So extended an examination of a small part of Dr. Kissinger's book might be less justified, were it not for the very great value to be attached to much of his argument and many of his conclusions. No one could believe more strongly than the present writer that limited war is the more likely military contingency we may have to face in the immediate future, nor that we are far from prepared for that contingency. The true cause of this lies partly in the predominance of budgetary considerations over military, and to an even greater extent—as already remarked—on the failure (up to the present time) of our political leadership to define a clear-cut positive national objective in our continuing

struggle against the Communist threat of world domination.

Insofar as organizational changes can help us to correct these ills, the greatest advance that we could make would be to insure that policy decisions at the top level contain their due and proper ingredient or professional military advice. We cannot do this by reorganizing the Joint Chiefs of Staff, much less by changing the whole structure and fragmenting the prestige of our military services. We can do it only by bringing closer together, in habitual and constant collaboration, the Secretary of Defense and his military advisers. It is the Secretary of Defense who must carry the military ball on that final playing field. He can do so usefully only if he comes to the field as the trusted and accepted voice of the military services, and that can happen only when he is fully acquainted with their problems, has listened to the advice of their chiefs, and has participated with those chiefs in the solution of difficulties and differences.

As a beginning, it might be helpful if the Secretary of Defense were to adopt the plan found useful by Sir Winston Churchill during the late war —to habitually take the chair himself at meetings of the Joint Chiefs when matters of vital importance are on the agenda, and in any case not less than twice a month. It would not take long for a man accustomed to organizational problems to perceive the truly appalling delays and uncertainties occasioned by the present jungle of committees, sub-committees, coordinating groups, assistant and deputy assistant secretaries in the Department of Defense, and to a less extent in the military departments. Thus to the beneficial effects of direct contact between the Secretary of Defense and his military advisers might be added increased freedom of action and a more direct flow of advice upward and decision downward.

The emergence of the Secretary of Defense as the responsible spokesman at the highest level for the professional military views of the Joint Chiefs of Staff and the clearing away of the bureaucratic underbrush which now obstructs all that is accomplished or sought to be accomplished within the defense and military departments would necessarily have two major results:

(1) The decision as to whether the country can or cannot afford a given level of military force would not, as Dr. Kissinger justly observes, so often go against the military contentions for the reason that there is always a clear fiscal policy opposed to a "fuzzy" Defense Department policy. The economists might still win out, but not without a clear unequivocal weighing of the military risk involved.

(2) A clear Defense Department policy both in the National Security Council and the Cabinet would have a strengthening effect on the over-all consideration of national objectives and on the choice of intermediate objectives contributory thereto. There is, for example, little doubt in this writer's mind that military opinion expressed by a responsible and convinced civilian spokesman would, in the fall of 1955, have overborne State Department hesitations and resulted in a flat prohibition on the shipment of Soviet arms to Egypt—with beneficial results which are clear enough in what the late Al Smith used to call "the blessed golden light of after-knowledge."

These are the organizational reforms that we need if our military services are to pull their weight in the policy team—as they must if we are to prevail against the enemy. There is nothing basically wrong with the military establishment of this country, but it most urgently needs a greater voice in the policies it must serve, and a clearer idea of what the nation requires of it.

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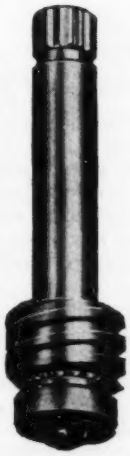

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USAFI Course Fees Increase July 1

WASHINGTON (AFPS)—**The United States Armed Forces Institute (USAFI)** correspondence course enrollment fee of $2, which dates back to the time privates made $21 a month, **will be increased** to $5 next **July 1.**

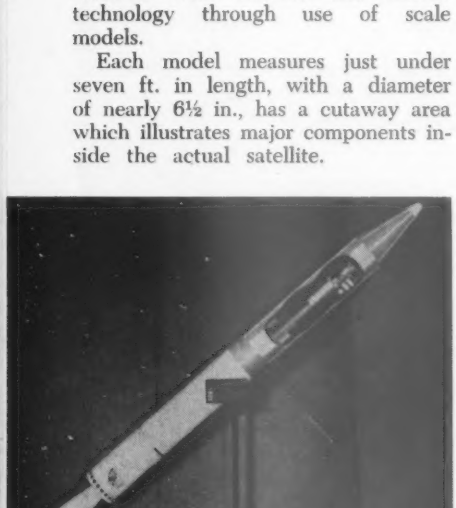
Brig. Gen. S. F. Giffin, director, Office of Armed Forces Information and Education, in announcing the higher fee, said a serviceman conceivably could take as many as 150 USAFI courses without added cost, provided he successfully completes each course in which he enrolled. Raising the enrollment fee—a one-time charge for most service students—is mandatory because the average cost of materials for a single USAFI correspondence course is now $6.75.

Ship First Satellite Models

Production of some 300 basic engineering models of **Explorer I,** this country's first successfully launched satellite, has just been completed for Army college ROTC units by **Ivel Construction Corp.**

The Ivel firm, designers and builders of displays and exhibits, constructed the plastic models under contract to the Defense Supply Service. The contract represents the first direct appropriation made to acquaint ROTC students with missiles and missile technology through use of scale models.

Each model measures just under seven ft. in length, with a diameter of nearly 6½ in., has a cutaway area which illustrates major components inside the actual satellite.

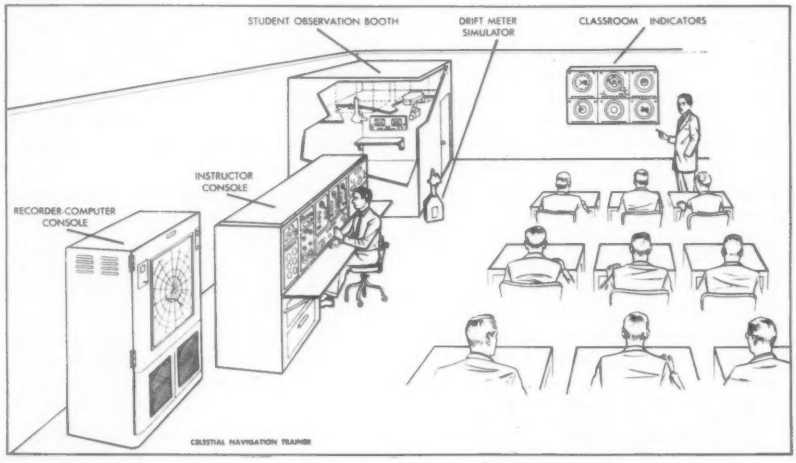


Celestial Navigation Trainer Details Released

The Reflectone Corporation has unveiled its new **1A19 Celestial Navigation Trainer,** first classroom trainer of its type, developed in conjunction with the **U.S. Naval Training Devices Center, Port Washington, N.Y.** Designed, developed, and constructed at Reflectone in only 7½ months, this first unit was delivered to an operational Naval Air Station in the Territory of Hawaii. Because of its importance and immediate application, the complete system was airlifted to Hawaii by the Navy.

The 1A19 Celestial Navigation Trainer is ground-based classroom equipment designed to teach all aspects of dead reckoning, celestial, and pressure pattern navigation to new students and to provide refresher exercises for the experienced navigator. It incorporates latest navigational techniques and is the most advanced approach yet to actual flight training. Simultaneous training of approximately 10 navigators can be effected. Larger classes can be accommodated, the only limit being available observation time, which is to be shared by individual students.

In operation, the 1A19 simulates a modern high-speed, long-range aircraft carrying the student navigators. Students are introduced to all equipment with which the navigator would be faced when in flight. Resultant training economies are obvious. By freeing training aircraft for full duty, the Reflectone Trainer saves many thousands of dollars per training hour. And it is versatile enough to introduce all conditions to be found in actual flight training.



Army Graduates First Advanced Executive Class

Army Transportation Supply and Maintenance Command, St. Louis, graduated its first **Advanced Executive Development class** recently. The 28-hour course, conducted on a seminar basis, included studies in general management, techniques, tools and functions of management, effective communications, human relations and executive development and self-improvement.

Designed to bring the school to the student, the class is one phase of a broad management-development program under way in the command. From typist to manager, personnel attend, at one time or other, one or more of the courses taught within the command. Others are attending night school at the universities here, with the Army, in many cases, paying part of their tuition.

New Navy Jet Trainer Proposed

An advanced, more powerful **version** of the Navy's new jet trainer, **the TT-1,** is being proposed to teach carrier-landing techniques, **Temco Aircraft Corp.** officials have revealed.

The new model, called the TTX, is an advanced development of the original model which was designed from the start to accommodate larger

engines and carry a large part of the Navy's jet training syllabus. The TT-1, the first primary jet trainer to be accepted by any of the U.S. military services, is being delivered to the Navy. The primary version is equipped with a 920-lb.-thrust engine. A 1025-lb.-thrust engine is now being tested in the prototype.

Army Missile School Passes 3,000 Mark

Army Ordnance Guided Missile School, Huntsville, has passed the 3000 mark in personnel and **ranks among the three largest educational institutions in Alabama. Col. H. S. Newhall,** commandant, predicted the figure may double within a year. The Space Age University has 1300 students and a campus of 87 buildings with equipment valued in excess of $75 million.

Teaching staff includes more than 500 instructors. Total faculty and staff totals more than 1470 persons, including Army Signal Corps personnel and the Unit Training Center of the Missile School.

Officer Education Under AF Study

WASHINGTON (AFPS)—**The Air Force** has completed the **first step in a study** to determine the **educational level of its officers.**

The study, to test a theory that practical work has given many officers more education than their records show, took for its **first subjects** 1300 officers in training at the **Air University.**

It was discovered that 60% of those with only high school diplomas scored higher than the lowest quarter of college seniors in natural science tests, thus indicating the officers had gained knowledge of academic subjects without academic work.

Navy Honors Three For Propellant Work

Navy, in mid-May, **presented awards** to two civilians and a Naval officer for their work **in the development of solid propellants.** Honored were: **Dr. Karl Klager,** manager of the solid-propellant development division, Aerojet-General Corp., who received the Distinguished Public Service Award; **Elliott Mitchell,** chief propulsion scientist, Navy Bureau of Ordnance, the Distinguished Civilian Service Award; and **Comdr. William J. Corcoran,** special projects office (Polaris), letter of commendation.

Army Sending COs Evaluation Form

The Army is now **sending** its field commanders an **Evaluation Form** to be used as an interim basis for awarding **proficiency pay to selected enlisted personnel** as soon as the program is given the final green light.

Intended as a warning order, Department of the Army Circular 611-12 states that field commanders and operating personnel may reproduce DA Form 2094-R (Evaluation Form and Recommendation for Proficiency Payment) for use pending implementation of the Enlisted Evaluation System early in FY 1959.

Newman Medal To Col. Gill, USAF

The Newman Medal, awarded annually **in recognition of** the most **outstanding contribution to military engineering,** was presented in late May to **Col. Edward C. Gill,** installations engineer at Headquarters Air Materiel Command, in Washington ceremonies.

The medal is offered to a member of Air Force installations, regular, reserve, National Guard or civilian, on active or inactive duty or retired, in recognition of the most outstanding contribution to military engineering through achievement in design, construction, administration, research or development.

Training Gear Arrives at Cooke

The General Electric Company has delivered **guidance equipment** to **Cooke Air Force Base, Calif.,** to be used in training Air Force crews in operation of the company's **radio-inertial guidance system** on the Air Force Atlas ICBM.

Installation has already begun. First GE instructors are scheduled to arrive in July to set up the training program slated to begin in early September.

Reservists Share Training Base

The first joint air reserve training field with facilities for air reservists of **three services** has been dedicated in **Louisiana.**

As many as 1800 "Weekend Warriors" of the Naval and Marine Air Reserves, Air Force Reserve and Air National Guard will train at the facility just outside New Orleans, which will be officially known as **U.S. Naval Air Station, Alvin Callender Field.** Each Service will have its own hangars, but the operations tower, two enlisted barracks and mess hall are shared by the services.

White Sands Plans New Housing

A design directive has been issued for **White Sands Proving Ground's** third **Capehart housing project.** The directive was issued in Washington as families were moving into the post's first Capehart project and as a contractor began construction of a second one.

Total cost of the proposed 200 Army units will be **slightly over $3 million.** Meanwhile, a fourth Capehart project (51 Navy units) is also under consideration for White Sands.

Kolligian Trophy To Air Force Major Tyson

The initial award of the U.S. Air Force's **Koren Kolligian, Jr., flight safety trophy** was made in May to **Major Samuel W. Tyson** by General Curtis E. LeMay. The trophy, which will be awarded annually to the aircrewman who most successfully copes with an emergency situation in flight, was presented to Major Tyson for piloting a crippled C-97 aircraft with 67 persons aboard to safety on August 8, 1957.

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Armed Forces Management Association Fourth Annual National Conference

Said Defense Secretary Neil McElroy, in opening the two-day conference on May 15:

"It is a pleasure to have the opportunity to welcome the members of the Armed Forces Management Association at the opening of your Fourth National Conference in the Pentagon today.

Welcomer McElroy

Keynoter Waterman

"The objectives of your Association are most commendable, and it is today more necessary than ever for all personnel in the Department of Defense to lend every effort to insure the optimum use of the funds which are made available to the Department of Defense.

"I hope that the membership of the Armed Forces Management Association will continue to increase and that enthusiasm for the achievement of your objectives will continue to grow. The Department of Defense would welcome the establishment of local chapters at every major U.S. defense installation."

Then came a two-day-long parade of top military and civilian experts on research and development, guided missiles, electronic data-processing equipment. Among them:

Gordon E. Dean, Senior Vice President, Nuclear Energy, General Dynamics Corp., principal speaker at the Thursday evening dinner, who said in his talk: "We can't match Russia and the communistic world in manpower but we must surpass them in quality. This country is caught in a dilemma—national security will cost more than we are prepared to pay and will place a serious strain on our national economy, but we must pay that high price for survival. We may expect to spend an additional $9 billion annually for national defense within 4 to 5 years."

Dr. Alan T. Waterman, director, National Science Foundation, who said:

"Every country is now aware of the overriding importance to its future of its progress in science and technology. The United States is no exception. We have the industrial capacity, the experience and the know-how. What we lack are: the trained men and women for the job and the encouragement and support of basic research which forms the source of new developments and thoroughly up-to-date engineering. We can only insure the possibility of full protection of national security by giving every encouragement to scientific research (as contrasted with development and production)."

Leader Poole

Speaker Dean

Full proceedings of the Conference may be obtained by nonmembers from AFMA, 1635 N. Woodstock St., Arlington 7, Va., at $2 per copy. For members, all talks and speeches, in entirety in most cases, will be reprinted in the next issue of the Association's quarterly publication, *Command Management*.

Other highlights of the Conference included:

Rawlings Poole Heads AFMA

Rawlings S. Poole, assistant to the Assistant Secretary of Defense, Properties and Installations, has been elected National President, Armed Forces Management Association for 1958-59.

At his installation during the Conference, Poole said:

"There is already conclusive evidence that the provision, maintenance and operation of weapons systems in this missile-space age has greatly complicated the task of command and management, and will involve astronomical future expenditures.

"The President and the Secretary of Defense have indicated that now is the time for employees of our defense establishment, including members of our Armed Services, to join in a concerted effort to insure optimum use of every defense dollar made available by the Congress.

"Accordingly, during the forthcoming year, consistent with the stated objectives of our Association, we pledge to itensify our efforts as follows: First, to extend and expand local chapters at U.S. defense installations, and to thereby provide an effective medium for stimulating and encouraging individual and collective effort to voluntarily supplement the regular programs for improving management throughout the Defense Establishment; second, to establish our Association, through its chapters, as the world's foremost forum for exchange of defense-management experience and techniques among the various elements of the DoD and between them and industry."

Panel of experts which outlined Research and Development for National Security. From the left: Dr. Orr Reynolds, director of science, office of assistant secretary of defense; RAdm. Rawson Bennett, chief of naval research; Dr. Richard Emberson, assistant to the president, Associated Universities, Inc.; panel Chairman Maj. Gen. Don Ostrander, deputy commander for resources, Hq, Air Research and Development Command; Ralph Clark, Stanford Research Institute; Brig. Gen. T. J. Conway, director of research, office of Army chief of research and development.

Corporate Members Join AFMA

During the annual dinner at Ft. Myer, Va., May 15, Carl Freedman, President of the Armed Forces Management Association, presented corporate membership certificates to representatives of Nuclear Products Division, ERCO Div., ACF Industries; Sylvania Electric Products, Inc.; Radio Corporation of America; and International Business Machines.

AFMA Selects Outstanding Chapter

Wright Brothers Chapter of Armed Forces Management Association was chosen by the Association as outstanding field chapter during 1957-8. This chapter published several technical articles in the field of military management and publicized its management activities on various television programs.

Accepting the award from Carl Freedman, National President of AFMA, was Herbert L. Myers, Jr., President of the Wright Bros. Chapter and Director of the Dept. of Management, Air Force Institute of Technology, Air Materiel Command, Dayton, Ohio.

Individual Awards

Herbert L. Myers, Jr., Director of Dept. of Mgt., Air Force Institute of Technology, Air Materiel Command, and Maj. Nicholas A. Beninate, Office of The Adjutant General, Dept. of the Army, were honored by Armed Forces Management Association for their outstanding individual contributions to the Association. Dr. Myers is President of the Wright Brothers Chapter, AFMA, and Major Beninate is President of the National Capital Chapter, AFMA.

Mr. Carl Freedman, National Association President, presented the awards during the annual dinner at Ft. Myer, Va., Thursday, May 15th.

AFMA Makes Management Awards

For their outstanding contributions to military management, honorary life membership awards were made by Armed Forces Management Association during the annual dinner at Ft. Myer, Va., Thursday, May 15th. They were: Col. Darwin E. Ellett, USAF, who received the award of Gen. E. W. Rawlings, USAF, Commanding Air Materiel Command; Lt. Gen. Thomas E. Hickey, USA, Ret'd, recently Commanding General, Third U.S. Army; Hon. August E. Johansen, Representative in Congress; Lt. Col. Mary E. Elred, USAF, receiving the award of Dr. Lillian M. Gilbreth.

Dates to Circle

June 9-10
Canadian Computer Conference—Toronto, Canada.

June 9-12
National Materials Handling Show—Cleveland, Ohio.

June 9-13
International Automation Exposition and Congress—Coliseum, New York, N.Y.

June 11-13
Association for Computing Machinery Annual Meeting—Urbana, Ill.

June 12-14
Ninth Annual National Conference and Convention of the American Institute of Industrial Engineers—Hotel Statler, Los Angeles.

June 14 to July 3
Three-week training program for middle managers—Lake Arrowhead Conference Center; sponsored by University of California Graduate School of Business Administration.

June 16-18
Second National Convention on Military Electronics—Washington, D.C.

June 17-20
Annual Cornell University Industrial Engineering Seminar—Cornell University, Ithaca, New York.

June 24-26
Aviation Distributors and Manufacturers Assoc., 31st Meeting—Mt. Washington Hotel, Bretton Woods, N.H.

August 7-8
Annual Conference, Western Region of American Society for Quality Control—El Cortez Hotel, San Diego.

September 15-19
Instrument Society of America Automation Conference, Philadelphia, Pa.

October 27-28
Fifth Annual East Coast Conference, Aeronautical and Navigational Electronics—Lord Baltimore Hotel, Baltimore, Md.

November 4-5
Second Annual Executive Techniques for Industrial Engineering seminar—Hotel Sherman, Chicago; sponsored by the Industrial Management Society.

November 5-7
22nd Annual Industrial Engineering and Management Clinic—Hotel Sherman, Chicago; sponsored by the Industrial Management Society.

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This Month: Joseph J. Liebling

Assistant for Security to Air Force Deputy Chiefs of Staff for Materiel and Development

IN A SMALL, carpeted office in room 4E289, The Pentagon, sits a man whose daily decisions affect thousands of Air Force documents and military equipment under research and development and in production. The man's name: Joe Liebling. His job: Assistant for Security to the Air Force Deputy Chiefs of Staff for *both* Materiel and Development. The Assistant for Security is responsible for administration, supervision and coordination of security and intelligence matters pertaining to the USAF research and development and materiel fields on a domestic and international basis.

A personable, well-liked Civil Service employee, 38-year-old Joe Liebling also works in a field belabored in recent months by Congress and the Nation's scientists for its "stranglehold" on the information they need to do their jobs. Security, under constant criticism, threatens to become, in the military mind, a stereotyped ogre hampering the defense effort—particularly in research and development.

To the men who daily decide what is secret and what is not, many of the attacks seem unwarranted, indicate a lack of appreciation of the problems of security classification.

Adept at the classification business because of a unique background (he is the originator of the security classification directive applied to military technical developments used in the military departments and the aviation contracting facilities), Liebling needs only a small staff (four people) to serve his two bosses. In addition to the overall Air Force responsibility, the job is in fact representative of the technical tasks assigned to Lt. Gen. Clarence S. Irvine, the Deputy Chief of Staff, Materiel, and Lt. Gen. Donald L. Putt, the Deputy Chief of Staff, Development. His small staff is, in itself, unique in military security policy circles, being the only operation of its kind in a military department indicating a truly unified, consistent-decision approach to security and technology, evidence of the confidence placed in him by the Air Force. Liebling's decisions affect 17 general-officer posts in Materiel and Development in addition to the Air Materiel and Air Research and Development Commands.

His biggest problem: "We have to avoid having a lawyer perform an appendectomy"; *i.e.*, decisions must be made on the basis of knowledge and experience, not just a set of regulations. To acquire this knowledge, Liebling has traveled four continents; he has visited almost all major USAF contractor facilities engaged in aircraft, jet-engines and guided-missile work, and research and development test centers in the United States; and has represented the USAF and the U.S. at international conferences regarding security policy matters. Involved in U.S. international commitments (NATO, MAP, etc.), he recently took an international law course at the University of Maryland to find out what all of this meant. He also works closely with the State Department as the Air Force authority for reviewing security aspects under the international-traffic-in-arms regulations and export control, and for the program of increased sharing of information with our allies on research and development and production.

Holder of one of the few Horatio Alger biographies in the Pentagon, Joe Liebling grew up on the streets of New York. He entered Brooklyn College when he was 16, spent his time on sports (boxing, basketball, weightlifting, varsity wrestling), left without graduating because he "couldn't get used to sitting still in class at that age." To help pay expenses, he worked after school in New York's famed garment center and for a short time was general manager, at 19, of an industrial novelties firm. During the summer, he migrated to East Coast tourist resorts where he waited tables during the day, worked as a comic master-of-ceremonies at night. In his younger days he also found time to take violin lessons and was selected to participate in a special concert at the age of 13 under one of the philharmonic symphony conductors.

In 1941, his brother, a Washington Government worker, suggested he take a Civil Service exam because "you've got nothing to lose." He did, got a job as an assistant messenger in the War Department. Shortly afterwards, he suggested a new idea for reorganizing the file mail and records system, got a boost up the Civil Service ladder, and at the age of 24, was a special staff security adviser under General "Hap" Arnold, the first Commanding General of the Army Air Forces.

Fascinated by the security field, in 1943, while working under the public relations organization, he asked an Air Force officer if it were possible for a civilian to handle a security-review job on information intended for public release. He was told "No, definitely not." So he began reading everything he could on the Air Force and anything else remotely connected with security classification and military technical developments and projects, soon had Air Force security officers coming to him for opinions. He became the first civilian authorized to review military information for public release and when the Air Force Committee on Release of Technical Information to the public disbanded, he got the job and the Committee's functions with it.

Today, he constantly conducts surveys to accomplish practical security, makes it a practice to consult with project officers and top civilian engineers in a weapon system before making a classification decision.

In his job, he starts with the basic premise that all information has intelligence value to a potential enemy, then asks himself the question, "In spite of this fact, is the release of the information detrimental to the U.S.?" An example: Is it probably more practical to declassify a Confidential document than to relocate 25 scientists and engineers at a cost of a quarter million dollars—which continued classification might require?

Joe Liebling's office deals with all phases of Air Force technological effort except Operations and Plans. He mixes

generous amounts of experience, technical evaluation and security criteria to come up with a decision. Training, he says, plays an important role in his ability to do his job. Any man in a similar position, he thinks, should have either an engineering or legal degree —or an equivalent amount of experience.

The starting point in his work is his responsibility to sustain a military program. He has a vast amount of facilities available to aid him in performing the real trick to his trade—making the decision to release the information or equipment to meet the operational objective in the first place. "After that," he says, "it's relatively easy to handle classification problems."

After World War II Liebling supervised the Air Force program for declassification of technical reports of benefit to business, science and industry. His constant reviews of the security classification program have led him to believe this is not, in actual fact, such a difficult problem to readjust. (Dr. Edward Teller, associate director of the University of California Radiation Laboratory, in a recent television interview, was asked a question concerning a sensitive atomic and missiles program. Dr. Teller was reluctant to answer and said he was not sure whether he could answer because "I am not qualified in the science of security"—but he didn't want to take any chances).

Married in 1951 to Diane Doris Jacobs of Washington, D.C., the Lieblings have a four-year-old son. Liebling, to keep up with the field in which he works, has made his job as much a part of his life as his family. Grateful for the way his career has worked out, he insists (in spite of the small staff) that his is not a one-man operation. "None of this would have been possible," he says, "without the help of a great many persons—military and civilian—who have backed me."

As one good example of a permanent career executive civil servant and winner of the Arthur S. Flemming Award (from the Junior Chamber of Commerce) as one of the Nation's 10 outstanding young men in the Federal Service in 1957 (in addition to several other awards including the Air Force Exceptional Civil Service Gold Medal Award), Joe Liebling said, when he started out in security, "I decided to make it my business to become the top man in the field." As far as the Air Force and most people are concerned, the title on his office door says he has succeeded. According to Generals Irvine and Putt, "he is the best qualified individual in the Air Force to do the job."

Professional Services

This is an exclusive feature to aid the services in obtaining highly skilled personnel, GS-9 rating and above. Vacancies shown are official releases from the offices concerned. Apply direct to the installation where the vacancy exists. For information about other jobs visit or write the nearest military installation.

Headquarters, Navy Department
Employment Section, Main Navy Building,
Washington 25, D.C.

ENGINEERS

Aeronautical GS-11
Aeronautical GS-12
Aeronautical GS-9 to 12
Aeronautical GS-11 or 12
Aeronautical Development Control GS-12
Aircraft Engine Inspector GS-13
Aircraft Inspector (Electronics) GS-13
Architects (General) GS-9 and 11
Electronic GS-11 or 12
General GS-12
General GS-12
General (Electronics), Dutypost in Garden City, New York GS-13
General (Nuclear Power) GS-13
General Ordnance Design GS-12
Mechanical GS-11
Mechanical, Dutypost at Marine Corps Base, Twentynine Palms, California GS-9
Missile Launcher Design GS-12
Ordnance GS-11
Ordnance GS-11
Power Plant Development GS-9 to 12
Structural GS-11
Structural GS-9 or 11

ADMINISTRATIVE AND TECHNICAL POSITIONS

Computer Problem Analyst (Supvr.) GS-11
Digital Computer Systems Analyst GS-11
Digital Computer Systems Specialist GS-9 or 11
Mathematical Statistician GS-14

POSITIONS REQUIRING PERMANENT CIVIL SERVICE STATUS

ENGINEER POSITIONS

Construction Management (Tech. Bldgs.) GS-12
Construction Management (Airfields) GS-11 or 12
Electrical GS-12
Electronics (Instrumentation) GS-12
Electronics GS-14
Ordnance GS-12

ADMINISTRATIVE AND TECHNICAL POSITIONS

Accountant GS-9
Accountant GS-12
Aircraft Engine Inspector GS-13
Contract Specialists GS-12
Digital Computer Systems Analyst GS-13
Digital Computer Systems Specialist GS-12
Librarian (Administration) GS-13
Management Analysis Officer GS-13
Management Analyst GS-12
Personnel Accounting Assistant GS-9
Property Disposal Officer GS-11
Radio-TV Script Writer GS-9
Tab. Project Planner GS-11

PRNC, Administration Building
U.S. Naval Gun Factory
Washington 25, D.C.

Aeronautical Research Engineer (Structures) GS-13
Electronics Engineers GS-12 and 13
General Engineer GS-12
Supervisory Librarian GS-9

Commanding Officer
U.S. Naval Aviation Ordnance
Test Station
Chincoteague, Virginia

Engineer, Electrical GS-9 to 11
Engineer, Electronic GS-9 to 11
Engineer, Mechanical GS-9 to 11
Engineer, Ordnance GS-9 to 11
Mathematician GS-12 or 13

Industrial Relations Officer
U.S. Naval Avionics Facility
Indianapolis 18, Indiana

Electronic Engineer GS-9, 11
Electrical Engineer GS-9, 11
Electronic Scientist GS-9, 11
Fire Control Design Engineer GS-9, 11
Mechanical Engineer GS-9, 11
Physicist GS-9, 11

Industrial Relations Officer
Marine Corps Base
Twentynine Palms, California

Mechanical Engineer GS-9

U.S. Army Electronic Proving Ground
Fort Huachuca, Arizona

Electronic Engineer (Wire Communication, General) GS-12
Electronic Engineer (Radio, Wire Communication) GS-11
Supervisory Electronic Scientist (General) GS-12
Engineer (General) GS-9
Mathematician GS-13
Publications Editor (Physical Sciences & Engineering) GS-9
Supervisory Illustrator Draftsman GS-9
Supervisory Tabulating Equipment Operator GS-9
Investigator (General) GS-9
Employee Utilization Representative GS-9
Supervisory Placement Officer GS-9
Recreation Supervisor (Arts & Crafts) GS-9
Supervisory Librarian (Cataloging-Physical Sciences & Engineering) GS-9

Industrial Relations Officer
U.S. Naval Air Station
Miramar 45, California

Mechanical Engineer GS-11
Architect (General) GS-9
General Engineer GS-11

U.S. Naval Air Station
Corpus Christi, Texas

Electrical Engineer GS-9

Industrial Relations Officer
Air Station
Corpus Christi, Texas

Supervisory Electronic Engineer (General) GS-13

2nd Coast Guard District
St. Louis, Missouri

Electronics Engineer (Radio) GS-9

3rd Coast Guard District
New York, New York

Civil Engineer GS-11

5th Coast Guard District
Norfolk, Virginia

Electrical Engineer GS-11
Electronics Engineer (Radio) GS-9
Civil Engineer GS-9

7th Coast Guard District
Miami, Florida

Electrical Engineer GS-11

11th Coast Guard District
Long Beach, California

Civil Engineer GS-11

14th Coast Guard District
Honolulu, Hawaii

Civil Engineer GS-9

Problems In Technical Publication Management*

Fourth in a Series

by Roswell Ward
Technical Publication Management Consultant

ONE of the best methods of examining some of the problems in the management of publication departments in defense industry is to take a look at some of the difficulties which may be caused by cutbacks and other changes in contracts for military hardware for the Armed Forces.

Under any conditions, making advance estimates of the manpower required to carry out various types of contract obligations for preparing military instruction books is a difficult and exacting process. In most publication work labor cost is the principal items in preparing a manual to a point of printing readiness. Hence, a forecast of manpower requirements is the major element in any projected budget forecast, whether the publication manager is estimating what his situation will be if contracts are cut back, or whether he is attempting to predict what his situation will be in the event of taking on manuals for new products or contracts which call for substantially larger expenditures for equipment which the defense manufacturer is already supplying to the Armed Forces.

Some of the following data is essential for accurate planning to meet changing conditions:

1.—The publication-department cost records should include a record of the man-hours required by supervisors, editors, writers, illustrators and others who have worked on various types of manuals which have been completed in the past. Man-hour estimates are the basis for labor-cost estimates and these figures should be tabulated on the cost records for each publication project completed. It should show the title of the manual, the number of pages, the number of various types of illustrations, the amount of time and money expended on the outside with customers or other sources of necessary data, the amount of time spent in contract negotiations, and the amount of time spent by various staff members on each stage of the preparation of the manual up to printing. These manhour records should show the function, occupation, title, name and hours expended of each person who worked on the manual.

In the event that the manual was printed by the contractor, the printing cost summaries should be kept on a separate record. The obvious reason for keeping manhour records is that the rate of pay may change for various types of staff members. It may be necessary to cause changes in rate of pay in accurate forecasting.

2.—Since experience has shown that in most large publication departments there is a remarkable degree of variation in the productivity of various staff personnel, especially technical writers, I have at times attempted to make a rough "index of productivity" for each staff member. One method of estimating and recording individual productivity is to compute from the manpower records the number of words, per typical working day, the writer is able to produce in preparing the first draft of a manual. A productivity index of this type should be handled most carefully as it may change due to a variety of conditions, especially the writer's basic technical knowledge of the product and its application. Prior experience in writing manuals on the same subject as well as the writer's interest in the subject can also have a great deal of influence. Obviously, if the productivity index continues to be lower than the average for the department it may be that the technical writer concerned does not have the training, or adequate experience, or is not interested in the subject matter or has "gone stale." The productivity index may be an indication of problems of staff members involving relations with supervisors or of morale or of other factors.

The use of a productivity index for technical writers should be approached with extreme caution. It should be recognized as only an approximate rating of an individual. It should be kept as a confidential index used only by the publication manager or his personnel officer or editor-in-chief if the department is large enough to have one or another of these executives. Under no circumstances should a productivity index be used as a basis for disciplinary or other action, although properly used by the publication manager it can indicate possible individual staff problems which can be scrutinized more carefully.

3.—A complete personnel record on each staff member, particularly technical writers and illustrators, should be kept by the publication manager. This record should not only indicate experience and type of work done, but should also give some indication of the technical interests of each staff member. It has not been generally recognized that the quality of the work and the productivity of technical writers and illustrators may be greatly enhanced if they have a real interest in the subject matter. Also, at times, a technical writer or illustrator will "go stale" on the subject and should have some other type of subject matter to deal with or some other type duty.

With the above type of information, budget forecasts can be worked out in order to adjust to a reduction in the publication department or to prepare for various expanded commitments which may have arisen. In any case budget forecasts or readjustments can be made much more accurately if the records indicate which staff members should be assigned to specific types of publication projects in order to do the job most effectively and economically. Detailed records of this type will also be of great value in working out time schedules to give all concerned some idea of when various job commitments may be met.

(Continued next issue)

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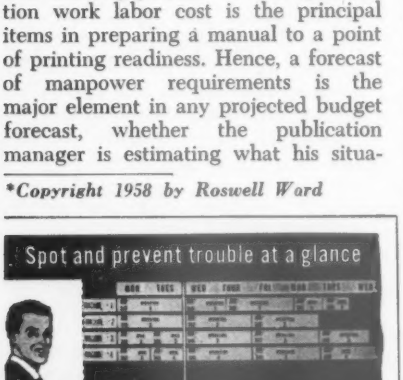

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HOW AMERICAN INDUSTRY LOOKS AT THE FUTURE

by W. Mac Stewart*

We have been hearing and reading a great deal about current business conditions. We read of layoffs, production cutbacks and a "recession." But in the midst of the scare headlines and gloomy predictions, there is one big question that is usually overlooked, and that question is a vital factor in the financial future of every investor, large or small:

WHAT IS THE ATTITUDE OF INDUSTRY ITSELF TOWARD THE FUTURE?

Economists can chart, project and hypothecate in every direction, but the key to the future actually lies in the opinions of the big corporations—the ones that ultimately govern the economic future of our Nation. And the best way to judge that opinion is by whether or not those corporations are putting their money on the line. So let's see just what they are doing about the future.

In 1957 capital outlays by business for new plants and equipment totaled about $36.5 billion. In the second quarter of 1958, such expenditures will be at the annual rate of $32.5 billion. This drop is considered by some as a factor in the current recession. However, it must be viewed in proper perspective. The largest cutbacks will be made by railroads and durable-goods manufacturers. But it is the durable-goods manufacturers who have been leading the rest in expansion the last few years. Many of these firms have already completed the major portion of the expansion needed for the next few years. The overall capital expenditures for industry, although slightly down from last year, will still be the *third highest* on record—exceeding all but the peak years of '56 and '57.

It is interesting to note that for 1958 public utilities are planning a 4% *increase* over 1957 in capital outlays, to supply heating and power for commercial, residential and industrial consumers.

It is possible that the slight drop in capital improvements will be even less than now predicted, for several reasons:

1. Growing competition within and between industries for the consumer's dollar.

2. Lower financing costs, due to "easier money."

3. Corporation managements' expressed unshaken faith in the long-term expansion and development of American industry.

4. Expenditures for plant modernization and replacement, likely to be higher than now supposed.

Let's look at a few industries and specific companies to see if they are "putting their money where their mouth is":

The oil industry alone will invest some $115 billion over the next 10 years to satisfy the Free World demand for oil. Typical of companies in that industry, Socony Mobil last year plowed almost $350 million—three times the amount of their dividends—back into capital and exploration expenditures. They have projected $435 million for the same purpose in 1958.

In the food industry, capital expenditure plans for 1958 show no important decline from 1957. For example, National Dairy Products Corp., the Nation's largest dairy foods producer, spent $51.3 million for capital outlays in 1957 and is planning the same amount in 1958. The expenditures are the largest in the company's history.

No comments about industrial expansion would be complete without a look at the 'big boys' of industry—companies like Standard Oil of New Jersey, General Electric and U.S. Steel. These three companies alone spent $1.8 billion in 1957 for new plant facilities, equipment and improvements. This does not include $300 million they spent in improving raw material supplies and reserves. Are they cutting back in 1958? Definitely not! These companies already are either committed to, or are planning, capital expenditures in 1958 that will not differ from the 1957 total by more than 2% either way.

Research and development, leading to new or improved products, is equally as important to our economic future as is plant expansion. At this time, all indications are that research expenditures will not be cut for 1958, and in many instances will be *increased*. Manufacturing concerns generally spend a sum averaging about 2% of their sales for research. Now, 2% doesn't sound like much. But a large company with sales of a billion dollars annually would spend in one year about $20,000,000 for research.

Actual research expenditures in many cases are much higher than 2%, particularly in industries where new product development is vital, such as in pharmaceuticals, electronics, aircraft, chemicals and others. Last year, for example, companies in the drug industry spent $127 million on medical research. Merck and Co. spent $13.1 million in its own research program—7% of its sales.

Typical of industry's feeling is the

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comment made by the President and the Chairman of the Board of Standard Oil (New Jersey) in that firm's annual report: "The readjustment in the economy that is now going on does not alter our confidence in the longer-range future. This is not the first time, nor will it be the last, when relatively short periods of consolidation follow years of rapid growth and lead on to further years of expansion. The rising level of population in the United States and in many areas abroad, and the growing desire for higher living standards throughout the world promise a return of economic expansion.

It is obvious that the major corporations in America are not concerned too deeply about this month or next month, but are busily preparing for the coming few years. They are gearing for greater production of new or improved products. And they are sufficiently confident of this bright future that they are plowing billions of dollars yearly back into research and plant expansion. All this is so that you and I, as consumers, can continue to enjoy the higher standards of living that their products and services provide. And you and I, as investors in American industry, will reap the rewards that go to those who help finance these advances and supply the capital that keeps the wheels of industry turning.

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Run Down of Key Contracts

Army

$500,000 plus for motor assemblies for Nike-Hercules guided missile to **National Electric Products Corp.**

$3.4 million to **Bell Helicopter Corp.** for H-13H helicopters.

$6 million to **American Motors Corp.** for production of Mighty Mite, new lightweight jeep-type vehicle for Marine Corps troop tests.

$65 million to **Chrysler Corp.** for 900 M48A2 medium-gun tanks. (Army Secretary Brucker has approved purchase, Army now dickering with Chrysler on the dollars and cents.)

$1.4 million to **Raytheon Mfg. Co.** for further Hawk missile development.

$750,000 to **Packard-Bell Electronics Corp.** for production of mobile electronic equipment.

$4.9 million to **Peter Kiewit Sons' Co.** for construction of nuclear powerplant in Alaska.

$47.9 million to **Western Electric** for continued work on Nike Hercules antiaircraft missile.

$3.3 million to **Philco Corp.** for instructional services.

$1.6 million to **Motorola, Inc.**, for radar reconnaissance systems.

$1.5 million to **North American Aviation** for work on Jupiter IRBM.

$1.4 million to **Hall Construction Co., N.J.**, for conversion of Nike Ajax missiles to Nike Hercules systems.

$1.4 million to **Nassau Construction Co., N.Y.**, for same job as above.

Navy

$31 million operating and production contract to **Callery Chemical Co.** for jet/missile fuel.

$27.5 million to **Sperry Gyroscope Co.** for production of Tartar missile radar sets and associated equipment.

$3.1 million to **Universal Match Corp.** for Terrier guided-missile launching equipment.

$17.9 million to **Westinghouse Electric Corp.** for reactor-compartment components for five nuclear-powered submarines.

$2 million R&D contract to **Lockheed's Cal. Div.** for land-based antisubmarine bomber.

$11.6 million to **Grumman Aircraft Engineering Corp.** for "futuristic" antisubmarine aircraft.

$5.6 million to **Westinghouse Electric Corp.** for improvement of J34 turbojet engine.

$1.5 million to **Radio Corp. of America** for mobile "C"-band instrumentation radar set.

$14 million to **Ford Instrument Co.** for production of computers for Tarter and Terrier missiles systems.

$3.25 million to **Arma Div., American Bosch Arma**, for production of torpedo fire-control systems.

$2.8 million to **Mine Safety Appliances Co.** and **General Textile Mill, Inc.**, for flying helmets.

Air Force

$1.1 million to **Champion Spark Plug Co.** for aircraft engine spark plugs.

$3.9 million to **North American Aviation, Inc.**, for rehabilitation and modification of 94 F-86D and 60 F-86F aircraft.

$5.2 million to **Specialized Propulsion and Control Eqpt. Co.** for aircraft maintenance docks for B-52 and KC-135 aircraft.

$2.7 million to **Collins Radio Co.** for high-frequency single sideband communications systems for B-52G and KC-135.

$1.6 million to **Magnavox Co.** for radar set components.

$1.7 million to **Grand Central Aircraft Co.** for IRAN and modification of 368 T-33A aircraft.

$5.6 million to **Sylvania Electric Products, Inc.**, for development of major electronic defense subsystem for B-52 long-range bomber.

$100 million to **General Electric** for development of J93 jet engine.

$11 million to **Douglas Aircraft** for work on C-133 aircraft.

$4.8 million, total to two contracts, to **Lockheed Aircraft Service International, Inc.**, for aircraft maintenance and overhaul work.

$24.6 million to **Allison Div., General Motors**, for advanced T-56-A-7 turboprop engines.

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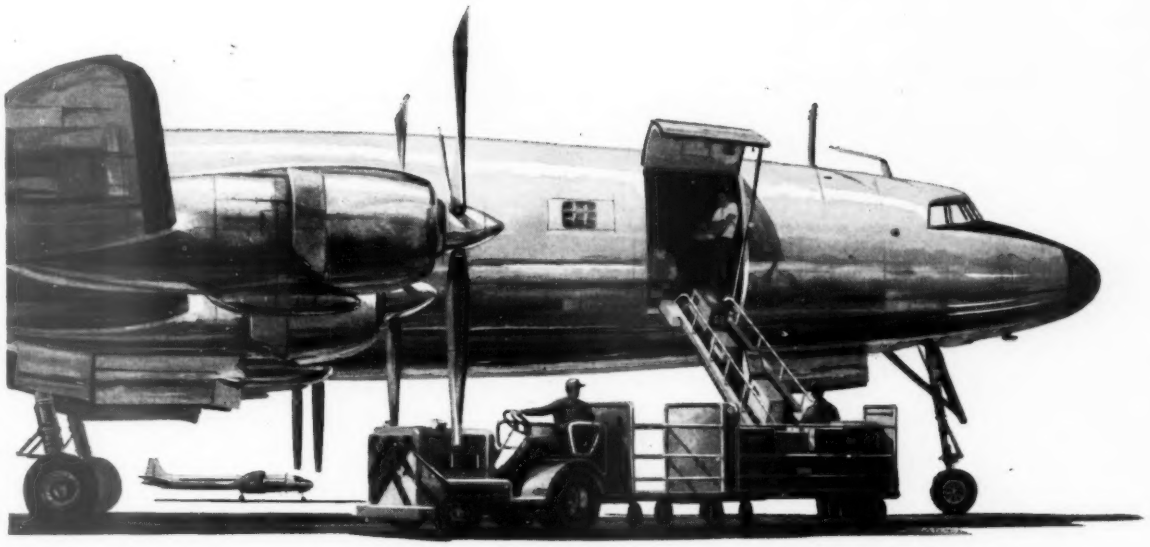

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